THE

JOURNAL OF GAS LIGHTING.

PUBLISHED QUARTERLY.

WITH AN INTERMEDIATE SUPPLEMENT ON THE 10TH OF EACH INTERVENING MONTH.

No. 6.] LONDON, JULY 10, 1849. [PRICE 1s.

CONTENTS.

	PAGE
Circular to Gas Companies	73
Communicated Articles:—	
Theory and Economy of Artificial Light	75
On the Comparative Value of Coal for the Purpose of Illumination	76
Gas Lighting in Paris	79
Correspondence:—	
Clay Retorts	82
Clay and Iron Retorts	82
Legal Intelligence:—	
Phœnix Gas Company *v.* Greenwich Parish	83
Review:—	
Gas Lighting: its Progress and its Prospects	87
Register of New Patents:—	
Wilkinson, for Improvements in the Construction of Coke Ovens, &c.	89
York, for Improvements in the Manufacture of Metallic Tubes	89
Knapton, for Improvements in the mode of Manufacturing Gasometers or Gasholders	89
Wilson, for Improvements in the Formation of Moulds and Cores of Moulds, &c.	89
Share List	90
Price Current	92

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Circular to Gas Companies.

The rating of the property of gas companies under the Parochial Assessment Act is a subject which has given rise to almost endless litigation, nor have the decisions of the superior courts tended much to elucidate the question, but rather, in some cases, to involve it in greater uncertainty. We refer our readers to an ample report (inserted elsewhere) of a case which we believe to be the most important one of this nature hitherto submitted to the decision of an inferior court, and which will fully bear out our statement. Although both parties in this instance professed to have based their calculations upon the principles recognised in the late decisions of the superior courts, their results were so widely different, that a brief review of the case may not be unacceptable to our readers.

The appellants were the Phœnix Gas Company, of Southwark, and the parish officers of St. Alphage, Greenwich, were respondents. The appeal was against a rate of £5671, made in April last upon the works and property of the appellants, situate in the parish of Greenwich, the previous rate having been £1680.

The appellants are proprietors of three works where gas is manufactured, viz,, Greenwich, Bankside, and Vauxhall stations, and of two gasholder stations. Their main pipes extend over twenty-three parishes in the counties of Kent and Surrey, the whole communicating together, so that it is impossible to ascertain the exact proportion of rental earned by each station; but it appeared that one-fourth of the total quantity of coal used was consumed at the Greenwich station, and the presumption is, consequently, that one-fourth of the total gas rental was earned by it. In presenting their case to the court they, therefore, treated the whole property as one concern, and proposed to divide the total rateable value between the several parishes, according to the present structural value of the apparatus and the surface occupied by the mains in each.

The books and accounts of the company were produced, and from them it appeared that, after deducting the current expenses of working the concern (less the directors' allowance), and charging five per cent. interest, and 12½ per cent. as the tenants' profits on the floating capital of £55,735 required for carrying on the trade, and £3452 for the reproduction and renewal of the property and insurance, there remained a surplus of £8758, which they submitted was the net annual rateable value of the whole property, of which £1316 was due to the Greenwich station, and £314 to the Greenwich mains, together £1630, instead of £5671, at which the parish surveyor had assessed them. These facts were fully sustained by the witnesses called on behalf of the appellants.

The respondents contended that it was practicable so to divide the districts as to ascertain the amount earned in each; and called witnesses to prove that the 120 retorts admitted to be in action at the Greenwich station would carbonize 14,235 tons of coals (4021 more than the appellants had proved to be the actual consumption), and also that, allowing 10,000 feet as the produce per ton, and 10 per cent. for loss by leakage, the revenue derived from the sale of gas would leave, after deducting interest on the floating capital, tenants' profits, an allowance for the reproduction and renewal of works, insurance, &c., a net rateable value for the Greenwich works and the mains dependent thereon of £15,196, of which £5711 was due to Greenwich parish, viz., £2000 to the works, and £3711 to the mains. On this basis the total rateable value of the whole property of the appellants would have been about £60,000, instead of £8758, at which the witnesses on the part of the appellants had estimated it.

No evidence was produced on the part of the respondents to show upon what principle they apportioned £2000, as the value of the Greenwich works, out of the £15,196 which they stated to be the rateable value of the works and mains dependent on them; and, as it was proved that the structural value of those works was about £40,000, while that of the mains in Greenwich parish was about £12,000, it appears strange that the former should be rated at only £2000, whilst the latter were charged at £3711.

The court, by its judgment, decided that the property *must be treated as a whole*, and that the total rateable value was £13,600, which must be subdivided amongst the twenty-three parishes in which the works and mains are situated, on the basis given by the witnesses on the part of the appellants. By this decision the rateable value of the Greenwich works is fixed at £2045, and of the Greenwich mains at £487; the former being £45 more than the assessment, and the latter £3224 *less!* What the object of the respondents in apportioning so large a part of the rent of the mains might be, does not clearly appear; possibly it may have been a firebrand thrown out amongst the twenty other parishes in which there are mains exclusively; but, if so, the judgment of the court has effectually defeated that intention, for a more signal defeat was never sustained.

As no intimation was given as to the process by which the court arrived at its determination, we are not able to explain how, with the evidence before it, which was uncontradicted in any point whatever, the sum of £13,600 was arrived at, instead of £8758, which the accounts produced proved to be the net rateable value. Perhaps, however (having had some experience in such matters), we ought not to be dissatisfied

with the judgment, as it sometimes happens that, for want of a settled principle, magistrates have taken the figures of both parties and halved the difference; which rule, if applied in this case, would have materially affected the result. It is not unlikely, however, that they may have applied the respondent's figures, as to the cost of gas, to the actual quantities proved by the appellants to have been manufactured; or they may have struck off some portion of the floating capital, and allowed a less rate than 12½ per cent. for tenants' profits. The decision, being final and without appeal, must be accepted as it stands, and furnishes some useful data by which other companies may be guided, under similar circumstances.

Mr. Penfold, to whose work on the rating of railways, gas, and water companies we have referred before, with the intention of analyzing its arguments, was the chief witness for the respondents. In his pamphlet, at page 76, he had given it as his opinion that the assessable value of a gas work is 47 per cent. on the gross gas rental. We are happy to find that he has now reduced this to 37 per cent.; two more similar leaps may probably bring him near to the correct rate, and we do not despair of seeing him arrive at this result. Had the court adopted his views, the rateable value of the whole property would have been 37 per cent. on the gross gas rental. The appellants estimated it at less than 12 per cent., and the judgment fixed it at a little more than 18¼ per cent.

We understand that the rates in the district in which the Phœnix Gas Company's works and mains are situated amount on an average to 5s. 9d. in the pound. The assessments would (if it had been maintained) have raised the rates to 7·67d. per 1000 feet of gas made, or 5s. 6d. per ton of coal distilled; whilst even under the actual assessment they will amount to 2·6d. per 1000 feet, or 1s. 11½d. per ton of coal. Our readers will recollect that, in the evidence given before the committee on the Great Central Consumers' Gas Bill, this charge was estimated at ·80d. per 1000 feet, the actual charge reduced in this instance being consequently three-and-a-quarter times that sum; and, to obtain even this small measure of justice, an expenditure of some hundreds of pounds has to be incurred. If such a warfare is continued, parochial authorities must not be surprised if an augmentation in the price of public lights be sought for.

Our views as to the *general principle* upon which property of this description should be rated are in accordance with those promulgated by the appellants in this case, although we must differ as to the mode adopted in apportioning the rent earned by the mains, amongst the different parishes in which they are situated. The appellants proved the total structural value of the mains to be £105,761; but instead of dividing this sum amongst the different parishes, according to the *value* of the mains in each parish, they proceeded to estimate the number of square yards occupied by the mains, and took *superficial area* as the basis of the apportionment. On this principle four pipes of 3 inches diameter occupy the same space, and enter into the subsequent calculations as of the same value, as one 12 inches, though every one must be aware that a main of the latter capacity is equal to sixteen of the former, and has contributed in that proportion to earn the total rent. The result of such a system is, that the large mains in the vicinity of the stations bear a less proportion of the whole rent, and the small mains at the extremities a larger proportion, than they are entitled to. Weight, structural value, or cubical contents are more equitable systems; but we prefer structural value as indicating most clearly the exact proportionate amount of rent earned by the capital expended. Neither weight nor cubical contents do this so accurately, as in the former case a ton of iron employed in small pipes costs more when laid, and earns less than when employed in large mains; and in the latter system a ton of iron converted into ten lineal yards of 12-inch main will convey nearly treble the quantity of gas which the same weight of metal converted into seven lines of 3-inch pipes, each ten yards long, would convey.

The jargon about separating the mains used for transmitting gas to distant parishes from those used for the local supply, and rating them distinctly, is an absurd impossibility. There may be particular cases where mains are laid for the supply of distant points, out of which no local supply is abstracted; but, in taking structural value as the basis of the apportionment, they obtain their full share of the rent more effectually than many abstruse calculations or speculations as to what are simple feeders, and what are general conduits for local distribution.

The whole case merits an attentive examination, and is destined to exercise an important influence over this branch of the expenditure of the metropolitan gas companies.

An esteemed correspondent in Paris has transmitted to us a translation, inserted elsewhere, of the contract under which that city is now lighted with gas. The translation is too faithful for it to read very grammatically in its present shape, but time does not permit us to procure a revised copy.

The circumstances under which this contract was concluded are instructive, and contrast favourably with the headlong course adopted by some corporate and municipal bodies in this country, in the pursuit of what is often miscalled economy.

In the origin of gas lighting in Paris, simple revocable permissions were granted by the authorities to various companies to lay down pipes for the supply of gas, without the stipulation of any express condition as to the terms upon which the supply should take place. In no case, however, was more than one authorization granted for the same district, of which the actual possessor had, therefore, the unrestricted monopoly. Under such patronage many of the companies became rich and powerful, so much so as to attract the envy and jealousy of a large and wealthy portion of the Parisian public; and in 1846, various attempts were made to encroach upon their hitherto respected rights, and a commission of the department, composed of its most intelligent and respectable citizens, was appointed to examine the question. Proposals of the most seductive kind flowed in upon them; but good sense and a strong perception of what was due to those who, in less encouraging times, had been induced to embark their fortunes in a novel branch of industry, maintained their ground, and resulted in a contract which we apprehend will be found to conciliate the interests of all parties.

The cost of gas in Paris may be estimated at 1s. 8d. per 1000 feet more than in London, arising from the high price of coal, difficult sale of coke, and increased expense of wear and tear. Making due allowance for this extra cost, we shall see that the Parisian prices are such as will, in all probability, enable the companies to pay back a large portion of their capital during their seventeen years' monopoly, and at its expiration they will be able, by reason of their position and situation with regard to the mains, to offer to manufacture gas for the authorities on more advantageous terms than a new company; while, on the other hand, the authorities, having become proprietors of the mains, will protect the gas consumer against any excessive charges. Should, however, the old companies refuse to continue to supply gas on the conditions proposed to them, they would suffer little from ceasing their operations and disposing of their works, the land on which most of them are erected having so much increased in value as to pay for the constructions upon it.

As the prices for public lights are quoted at per light, per hour, we have below calculated what the price would be according to our system of burning:—

Price in the Central Parts of the City.

3·5 feet per hour	for 4400 hours . . .	£4	5	7	per light.
4·9	ditto	ditto	6	0	3	—
7·	ditto	ditto	8	11	7	—

Prices in the Outskirts.

3·5 feet per hour	for 4400 hours . . .	£6	3	2	per light.
4·9	ditto	ditto	8	12	4	—
7·	ditto	dttto	12	6	0	—

Extra allowance for repairs, painting, &c., 12s. 2d. per lamp.

Some of the regulations may appear harsh and stringent, but, where prices like the above are paid, the authorities have a right to be well served; and few cities can equal Paris in the efficiency with which this department of its administration is conducted.

The article on clay retorts, which we had promised for our present number, must be delayed till a future one, as the experiments now in course of trial are not yet concluded. In the meantime we invite attention to a letter from one of our respected friends, not intended for publication, but written for our private information, on the accuracy of the statements, in which full reliance may be placed.

The iron trade continues in a very depressed state, without prospect of immediate relief. Large contracts have been taken at lower prices than quoted in our price current, but special bargains are scarcely criterions for regular transactions. Upon this subject the *Mining Journal* says:—

"The prospects of the iron trade are, at this moment, we regret to

say, a little overshadowed: that check which commerce has received by the continuance of political disturbances on the Continent has made itself somewhat too sensibly felt in the working iron districts of this kingdom. We live and thrive by the peaceable intercommunications of the trading world. It would be all the better for us if the Temple of Janus were continually shut; but it is not in human zeal, nor in human wisdom, to perpetuate the halcyon days of universal peace. In proportion, however, as that is interrupted, will be the interruption of our prosperity as a mercantile and mining people. There are other causes co-operating in the depression to which we advert; the make for some weeks past has somewhat outrun the actual wants of the world, and the lull which has fallen upon railway undertakings, and the restraints which have, unwisely as we think, being put on Government as to its increase of its steam navy, are so many ingredients which have immediately contributed to lower, for the moment, the iron markets of the United Kingdom.

"We trust that no more will be made of this temporary suspension of activity than it is entitled to; that as few furnaces will be blown out, the make as little reduced, and employment as generally continued as is possible under the circumstances; and we have great reason to hope, notwithstanding the somewhat serious declension of prices, that the turn things have taken, as well as the direct consequences of it, will be superficial in its depth, and short-lived in its duration. In some senses, certainly, it will be an occasion for patience and forbearance on the part of those chiefly and most intimately interested in this branch of our indigenous industry; and in most of the inconveniences which will sometimes over-spread our social as well as our commercial relations, feelings of this description are more likely than any others to furnish us with a remedy, or to supply an alleviation."

Communicated Articles.

THEORY AND ECONOMY OF ARTIFICIAL LIGHT.

No class of the community is subject to so much periodical deception as the gas and oil consumers of the metropolis. Considering the intelligence and number of those concerned, it is surprising that no one whose character would be a guarantee for the truth of his statement has hitherto stepped between them and the number of schemers who annually deluge the town with *newly-invented patented lamps*, each warranted to save their fortunate purchasers 50 per cent. at least, with an increase of light beyond all conception.

The whole of the planetary bodies have been called into requisition to stand godfathers and give appropriate names to those efforts of genius. We have had in succession the Solar, Lunar, Vesta, Meteor, and Comet lamps, each surpassing the other in under it.

The gas burners, fatigued with the company of the heavenly orbs, have taken a turn among the Lilies and Roses; while the glasses, with a deeper insight into the genius of humbug, have crept under the patronage of science, and go off very freely consequence.

As some proof of the consequent superiority of these novelties, testimonials are given for each by men whose names stand high in science. Whether the signatures attached to those impartial examinations into their relative merits are authentic or not, need scarcely be inquired into; it is sufficient for men of common sense to see that one-half of the scientific men engaged in this species of puffery are flying in the face of the other half, and that many of them do not even blush to affix their unqualified approbation on antagonistic circulars.

Most of these ephemeral productions find their way shortly to the brokers' stalls or the founder's melting-pot, and other novelties rise for the next race of fortunate purchasers.

I would not be understood to insinuate that there is an end to progress in this branch of art—that we shall have no further improvements in the means of effecting combustion, or in the materials concerned in the production of light; but I would desire that the public generally knew more of the laws of nature which are brought into action in the process, that they might be enabled the better to distinguish between empiricism and merit.

The greater number of those who have lately attempted improvements in this branch have been retrograding; they have not been so well acquainted with the subject as Argand, or Murdock, or Neilson—men whom they must first equal in knowledge before they can excel in invention. The trade seems, however, a thriving one, and men of all professions engage in it, mistaking the desire to invent for the ability; conceiving that innate genius (of which all men fancy they have their share) will supply the place of patient philosophical investigation; forgetting that to invent requires not only a suggestive mind, but an acquaintance with all that has previously been accomplished, or the chances are that the supposed invention may turn out some long-since exploded chimera.

The more ignorant such inventors are, the more obstinacy they evince; and as bold assertion, backed with a spice of puffing, goes a long way with the public, pecuniary success frequently crowns their endeavours, while men of modest merit, more scrupulous in assertions, conscious of defects existing in the most perfect schemes, are pushed into the kennel by their more confident rivals.

Trusting that knowledge is the best antidote to quackery, and that sound reasoning will stand in the place of an established name, I have ventured before the public with the view of giving some explanation of a subject in itself sufficiently simple, if it were not too frequently mystified by those who affect elucidation.

When any *solid* body is heated to about 600 deg. Fahrenheit, luminous rays are emitted by it, which are quite perceptible if daylight be excluded from the apartment operated in. The more the body is heated beyond this point, the more intense the rays of light become.

The same effect is not produced when *gaseous* matter is acted upon by heat; even when that is subjected to very high temperatures, little or no light is emitted from it. Hence a general rule is obtained that light is an effect produced by heat acting upon solid matter.

Those who have not investigated this subject may consider the foregoing rule in direct contradiction to our senses, seeing that the vapour from oil and candles, and the gas obtained from coals, are our exclusive sources of terrestrial light. It will, therefore, require a few experiments and some explanation to remove this impression from the mind.

For this purpose burn together a jet of hydrogen and oxygen gases; it will be apparent that the light produced from their combustion is almost imperceptible, and yet the flame is so hot that under its influence metals which are infusible in a smith's forge will be melted. It will also be observed that, so soon as any solid matter is put into the flame (no matter what the solid may be—iron, carbon, lime, clay—anything solid), it immediately passes from a red to a white heat, emitting numerous and brilliant rays of light.

Those who have not facilities for using hydrogen and oxygen may substitute for hydrogen, carburetted hydrogen, or coal gas; and for oxygen, atmospheric air—that is, a mixture of four parts of nitrogen to one of oxygen, and the stem of a tobacco pipe for a blowpipe, with which simple instrument a stream of air may be passed through a gas flame, and ample evidence obtained that even carburetted hydrogen emits very little light when treated in this manner; while small particles of solid matter, such as iron filings, passed through the flame, produce considerable light.

The question now suggests itself: How, then, is light produced from coal gas? The answer cannot be too deeply engraven on the minds of those who desire to understand this matter thoroughly. It is because *one of the ingredients of coal gas becomes solid matter previous to its combustion.*

Coal gas is composed of two elements—hydrogen and carbon: the former, a substance having a tendency, when uncombined with other matter, to assume the *gaseous* form; *the latter always existing in the solid state, except when in combination with some other matter*, such as hydrogen, which has the property of vaporizing it.

It will follow from these peculiar properties of the gases in question, that, if the hydrogen be extracted from any compound of the two, the carbon will be liberated in the solid form; and this is precisely what takes place during the combustion of gas.

Hydrogen has a greater affinity for oxygen than carbon, and, upon a stream of the mixed gases being ignited in air, enters first into combination with oxygen, thereby producing the blue-coloured flame so conspicuous at the lower part of an ordinary light. The carbon, being thus liberated in the form of particles of smoke or soot, does not, however, pass off in that form; but, being heated to whiteness, gives out light, and, at the same moment mixing with the oxygen of the air, again assumes the gaseous form, and passes off as carbonic acid gas.

There are numerous ways of proving that this change from the gaseous to the solid state, and from the solid to the gaseous, takes place during combustion. One way is to prevent the whole of the carbon from being consumed by preventing sufficient air from passing to the flame, when smoke will be thrown off from it. Another is to put a piece of metal wire into the flame at the blue part, when the wire will not be stained; but, if put into the white, it will be coated with smoke, *i. e., solid matter*: thus proving the existence of solid matter in the white but not in the blue flame.

A burning jet of gas may, therefore, be described as a cylinder of moving gas, to the circumference of which the hydrogen is first attracted, the carbon meanwhile passing up the centre of the burning ring to that point at which (the hydrogen having been consumed) its particles in a highly-heated state combine in succession with the oxygen of the external air.

Now, if instead of thus acting upon the hydrogen first, and the carbon afterwards, the mixed gases were ignited together, which may be done by mixing them with air or oxygen previously, very little light is produced. In this case the carbon never assumes the solid form, but is united to the oxygen the same instant that it leaves the hydrogen—thus passing from a union with one solvent to a union with another; and hence the general rule laid down, that *light is an effect produced by heat acting upon solid matter*, is exemplified in the combustion of gas.

It will be evident, from the explanation given of the mode of evolving light from coal gas, that the process does not differ widely from the lime light. This is produced from a jet of hydrogen and oxygen, previously mixed, being projected upon a small piece of lime. The oxygen and hydrogen, by their combustion, produce heat but no light: the heat acting upon the lime, which, being solid and not gaseous, emits light; and, as lime is of a phosphorescent nature, the light is of a very brilliant kind.

The lime light and the gas light are hence both produced by

the agency of oxygen and hydrogen acting upon solid matter: the difference being that the solid used in the one case is carbon, while in the other it is lime. In the one case the solid is presented exteriorly to the flame of the mixed gases, while in the other, one of the gases is the solvent of the solid and carries it up to the point of combustion before liberating it in the solid form.

There is but one other description of terrestrial light besides the two already described, viz., the electric light. It is well known that heat and electricity are intimately associated, the one never being developed without the other. By electricity, metals may be melted, water decomposed, and all the other effects of heat produced. It is, therefore, not very surprising that if particles be made hot by electricity they will emit light, and, if the heat be more intense than that produced by other means, the intensity of light will keep pace with the intensity of heat.

The electric light is produced by a current of electricity, which has the effect of intensely heating particles of carbon, the electric current performing the same part as oxygen and hydrogen in an ordinary gas light.

There are some solids, such as carbon, phosphorus, iron, &c., which, if ignited in an atmosphere of pure oxygen, emit very intense light; they therefore produce, by their union with oxygen, heat sufficient to render themselves luminous without the aid of hydrogen. Some of these bodies, even when surrounded with common air, give out light, but it is of a comparatively feeble character, of which a charcoal or coke fire will give an illustration. The cooling influence exerted by four volumes of nitrogen (which merely comes in contact with bodies burning in the air, without assisting combustion, as does the one volume of oxygen) is the cause of this loss of heat and consequent deficiency of light.

From what has been said, I believe that the functions which hydrogen, carbon, and air perform in the production of light may be readily deduced.

Hydrogen is the solvent of carbon, enabling the latter to be carried from the gas manufactory, through pipes, to the burner, where it is liberated in the form of solid matter.

Hydrogen is a combustible body, that is, it has the property of evolving heat when ignited with oxygen.

Carbon is the solid from which light is evolved, and it is, moreover, a combustible solid, producing, by its combustion with oxygen, heat to aid its own incandescence. Air, being composed of one volume of oxygen and four of nitrogen, yields its oxygen both to the hydrogen and carbon, and is what is termed the supporter of combustion to both.

I will now proceed to investigate the economy of producing light; the best proportions of carbon and hydrogen for this purpose; and the burners best adapted for the use of different materials; and, if what has been previously demonstrated of the functions of the elements concerned be borne in mind,—and also the inference which may be drawn from some of the preceding remarks, viz., that the quantity of light is proportionate to the quantity of carbon solidified, and the heat to which it is raised,—this will be neither a tedious nor a difficult undertaking.

The production of pure oxygen is attended with so much expense that, in an economical point of view, it is useless by its employment to attempt improving the quality of light Mr. Gurney, some time ago, lighted the Houses of Parliament by surrounding a coal gas or oil flame with oxygen: an arrangement termed a "Bude light;" the effect was strikingly beautiful, but the trouble and expense prevented its continuance. My investigation must, therefore, be limited to such lights as are adapted to burn in atmospheric air.

The materials used for artificial light are in three different states: solid, as sperm and tallow; liquid, as oil and naphtha; and gaseous. Those in the two former states require to be vaporized before combustion commences. Tallow, when made into candles, is, by the heat applied to the wick, first melted, forming a reservoir of liquid at the base of the wick; the capillary attraction exerted by the interstices of the wick next draws the heated tallow up to the flame, where it becomes vaporized, after which ignition takes place. Oil requires merely to be lifted to the flame by the wick, and vaporized; while gas, having been vaporized at the manufactory, requires no wick, but at once enters into combustion on being ignited in air.

The market values of those substances have no relation to the quantity of light they each afford. Wax and sperm made into candles, for instance, cost about 2s. per lb., while tallow costs only 6d. per lb.; yet tallow contains chemically nearly the same proportions of hydrogen and carbon as its two more expensive substitutes, and yields, weight for weight, the same light.

	Carbon.	Hydrogen.	Oxygen.	
Wax . . .	80·4 . . .	11·3 . . .	8·3	= 100
Sperm. . . .	79·5 . . .	11·6 . . .	8·9	= „
Suet . . .	79· . . .	11·7 . . .	9·3	= „

The advantages of the two former consist partly in their great purity, but principally from the properties they possess of requiring a higher heat to melt them; so that, when melted, the resulting liquid is thinner, and will more readily pass up through the interstices of a very fine wick. These properties are much prized: the first, from the solid and elegant appearance it confers; the second, because it allows a fine wick to be used, which will draw up exactly as much liquid as can be properly consumed.

Many people imagine when they see a candle or gas light smoking that the effect is produced by some impurity in the combustible material. There can be no greater mistake than this: the presence of smoke is only an indication of the richness and value of the material; the defect is in the mode of burning.

Neither are the prices of oils or naphtha indicative of their chemical properties. Common whale oil, if purified, or even some of the vegetable oils sold at 3s. 6d. per gallon (or about 4½d. per pound), are nearly identical in composition with sperm, sold as high as 6s. per gallon, or 8d. per pound; the latter, however, has an advantage over the former similar to that which wax has over tallow, viz., more perfect fluidity, enabling it to rise to a greater height from its level by the capillary attraction of the wick, consequently any alteration in the level of the oil in the reservoir is not so seriously felt.

Naphtha has a disadvantage of a different kind, being composed of hydrogen and carbon only, and, the latter being in excess, the scanty supply of oxygen in the air is not sufficient for its combustion.

It must not be forgotten, in estimating the relative economy of oil and tallow, that although, when burned in the same manner, they will each give, weight for weight, the same amount of light, yet as oil is generally burned, in argand burners, in a more advantageous manner, the carbon being more intensely heated, the same weight of oil from this cause alone gives out nearly double the quantity of light given by candles.

The flame produced from naphtha or turpentine always gives off smoke; these two substances being so rich in carbon that the hydrogen they contain does not produce heat sufficient to render the whole of the carbon incandescent. The ratio of the two elements in these substances is about six of carbon to one of hydrogen. Alcohol, on the contrary, when ignited, burns with a blue flame, and produces very little light; this arises from two causes: firstly, that alcohol is not rich in carbon; and secondly, because it has oxygen in its composition, which oxygen unites with the carbon at the moment it *would* become, were no oxygen present, solid.

A mixture of turpentine and alcohol affords a compound well fitted for producing light, and nearly identical in composition with oil or sperm, although differing in appearance.

Of all the materials used for illumination, gas is not only the most elegant and convenient, but also the cheapest; and it is surprising that the public have not to a greater extent availed themselves of its advantages. One thousand feet of gas, in London, weighs 30lb., and has as much illuminating matter in it as 3 gallons of oil. Gas of this weight at 5s. per 1000 feet will cost just 2d. per pound; and as, weight for weight, the same quantity of light can be produced from it when burned in the same manner as oil or sperm, it follows that gas is one-half cheaper than common oil, two-thirds cheaper than tallow, and ⅞ths cheaper than sperm.

If gas, like tallow, sperm, and wax, were sold by the pound, then consumers would have a better conception of the value of the commodity.

A. W.

(*To be continued.*)

ON THE COMPARATIVE VALUE OF COAL FOR THE PURPOSE OF ILLUMINATION.

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(*Concluded from page* 6.)

In the preceding part of this paper I have shown that gases from different coals not only require different times for the consumpt of equal volumes, but that for these consumpts different pressures are necessary. It is of importance, therefore, to ascertain whether the consumpt and the pressure bear the same ratio to each other, when different gases are used, that they do when the same gas is employed. The consumpt of gases, in some of the towns in England that I have visited, along with the pressure, was as follows,—the gases having been consumed from the same burner, and with the same height of flame:—

Gases.	Time for Consumpt of Cubic Foot by Meter.	Pressure at Burner in 100ths of Inch.	Square Roots of Pressures.	Time calculated by Square Root of Pressure.	Difference between Observed and Calculated Time.
	′ ″			′ ″	′ ″
Newcastle...	50 30	11	3·31	—	—
Leeds	55 55	9	3	55 40	0 15
Liverpool	57 0	8·5	2·92	57 6	0 6
Manchester ..	52 30	9	3	55 40	3 10

The following table gives the results with gases from Scottish parrot coal:—

Gases.	Time for Consumpt of Cubic Foot by Meter.	Pressure at Burner in 100ths of Inch.	Square Roots of Pressures.	Time calculated by Square Root of Pressure.	Difference between Observed and Calculated Time.
	′ ″			′ ″	′ ″
Lesmahago ..	85 0	42	6480	—	—
A.....	59 20	80	8944	61 30	2 10
B.....	69 5	64	8000	68 42	0 23
C.....	65 50	72	8485	66 0	0 10
D.....	90 50	38	6164	89 20	1 30

In the above tables the experimental results very nearly agree with those given by calculation; and, accordingly, we may consider the consumpt of different gases, from similar burners and under similar circumstances, to be as *the square roots of the pressures* necessary to burn them, under these circumstances; of course the times required for the consumpt of equal volumes will be *inversely as the roots of the pressures.*

Another important circumstance still remains to be ascertained, viz., as the pressures necessary for the consumpt of the gases varies, and as the consumpt also varies with the specific gravity, is there any connection between the specific gravity of different gases and the pressures necessary for their consumpt, under similar circumstances?

The following table gives the results of the consumpt of gases under similar circumstances, along with the pressures and the specific gravities taken in the usual way:—

Gases.	Pressure in 100ths of Inch.	Square Roots of Pressures.	Specific Gravity by Experiment.	Sp. Gr. calculated by Square Root of Pressure.	Difference between Experimental and Calculated Sp. Gr.
E.....	68	8246	580·6	—	—
F.....	47	6855	697·6	698	0·4
G.....	110	10488	458	460	2·0
Average of H, I, K, L, M, N, O, P, Q, R, S	42	6480	732	738	6·0

The results, by experiment and by calculation, above given, so very nearly correspond with one another, that I think we are warranted in concluding that the pressure corresponds with the specific gravity, and that, consequently, the specific gravity may be ascertained by the pressure when the gases are consumed under similar circumstances; having, of course, previously determined the specific gravity of a gas known to require a certain pressure for its consumpt. Consequently, the specific gravities being ascertained experimentally, the consumpts may be known; these being, *the times for equal consumpts, as the roots of the specific gravities,* and *the consumpts in equal times, inversely as these roots.*

Having established these positions, the next object I had in view was to ascertain, by a more extended series of trials, whether an indication of the consumpt of gases, in different places, could thus be obtained, without having recourse to a meter, which, to an experimenter, carrying one from place to place, is troublesome. It at first occurred to me that this might be done by ascertaining the specific gravity; but this also must be a troublesome process, and, unless ascertained with accuracy, would not tend to accurate results, especially in a hurried visit to different gasworks, where the height of the barometer cannot be always observed. After numerous trials, I at last determined to have recourse to the pressure-gauge, consuming the gas with a given height of flame, and always from the same burner. For this purpose I used, in my first trials, the platinum jet formerly alluded to, with an aperture of $\frac{1}{35}$ of an inch, furnished with a scale for measuring the height of flame, and with a pressure-gauge, to which a graduated scale, with a vernier, was applied, and by which the pressure at the burner, necessary to keep up the combustion at the desired height of flame, could be measured to 100ths of an inch. The diameter of the pressure-gauge was half an inch, which, though it gave considerable curve in the fluid, yet afforded more accurate results than when one with a smaller diameter was used. Indeed, I had recourse to various contrivances, such as floats in the water, with indices attached to them, and made to move on the scale; but I found, after numerous trials, that the simple wide gauge was by far the best, provided that care was taken to mark the height of the fluid from the same part of the curve. I always marked it from the bottom; and for this purpose had brass plates passing round the tube, and movable, so that they could be brought to the curve in both limbs.

In the following set of experiments the gases were prepared from a variety of coals by means of the experimental apparatus. The illuminating power was tried by the chlorine test. The specific gravity was taken in the usual way, by filling a vessel of known capacity with the gas, and noting at the same time the state of the thermometer and barometer. Not less than two trials were made with each coal, and the experiments with each gas were frequently repeated; and, when it was necessary, other gases were made, and the trials again repeated, so as to secure accuracy. The consumpt of the gas was ascertained in the usual way, by an accurate experimental meter; the trials with the specific gravity, the pressure, and chlorine, being frequently repeated. Instead of giving the names of the coals, I designate them by letters:—

Gases.	Illuminating Power by Clorine.	Pressure at Burner in 100ths of Inch.	Square Roots of Pressures.	Durability by Meter, 1 Foot Min.	Durability calculated by Square Root of Pressure.	Difference between Experimental and Calculated Durability.
					′ ″	′ ″
Standard	24	42	6480	58	—	—
A	8	122	11045	50	49·49	0·2
Aa.....	11·5	80	8944	59·20	61·36	2·16
B	13	76	8717	63·40	63·12	0·28
Bb	15	64	8000	69·6	68·48	0·17
C	15	72	8485	65·50	64·54	0·56
Cc.....	15	63	7937	69·24	68·40	1·4
D	15	60	7745	72	71	1·0
Dd	17	56	7489	72·20	71·15	1·5
E	23	40	6324	88·53	87	1·53
Ee.....	24	38	6164	90·50	90·48	0·2
F	19	50	7071	77·30	77·48	0·48
G	22	46	6782	81·40	81	0·40
H	12	79	8888	62·30	61·58	0·32
I	22·75	38	6164	90·50	89·18	1·32
K	12	72	8485	65	64·54	0·6

	′ ″
Average of the errors between the experimental and the calculated durability of the 16 trials	0·42

From the foregoing table it is evident, I think, that the mode of finding the consumpt by the pressure is sufficiently accurate for all practical purposes. I mean, of course, merely with a view of finding the durability of gases, as I do not propose it as a method for superseding the use of meters, to ascertain the quantity of gas consumed by different individuals. I must mention, however, that in one or two instances, the observed pressures did not give the consumpt as indicated by the meter: whether this was owing to a peculiarity in the gas, or to inaccuracy in noting the results, I do not know. At the time that the experiments were performed the results were merely marked down, and the calculations were made afterwards; and, after discovering the want of correspondence, I had not then an opportunity of repeating the trials with the same coal, which was very remarkable for affording a gas of a very high illuminating power. This was the more to be regretted, as the gas, being at one extremity as to quality, made it appear that there was some deviation from the rule I have laid down.*

From the foregoing experiments it is evident that the durability of a gas can be easily ascertained, by using a burner with an aperture of a certain diameter, having a scale for measuring the height of flame, and a gauge for observing the pressure at which the gas is burning at that height of flame; of course taking care to make the measurement with accuracy. The consumpt of any gas by this burner, with the height of flame fixed on, is first to be determined by meter, numerous trials being made; while, at the same time, at each trial the pressure is also noted. By this means, and taking the average of all the consumpts and pressures, a standard is obtained. Suppose that with a flame of 5 inches, and a pressure of $\frac{73}{100}$ths at the burner, the consumpt of a gas is, by meter, found to be 1 foot in 65 minutes; and that another gas requires, with the same burner and height of flame, a pressure of $\frac{94}{100}$ths; the square roots of these pressures are 8560254 and 9695359; then, as the latter is to the former, so is 65, the time for the consumpt of the latter, to 57·21, which is the time for the consumpt of the former. Now, $8560254 \times 65 = 5564165$; accordingly, this number, divided by the square roots of the pressures necessary for the consumpt of other gases, will give the times for the consumpts of these gases, when consumed with the same burner, and with the same height of flame.

The jets now in general use vary from the 28th of an inch, as recommended by Christison and Turner, to the 45th of an inch. Most of the trials which I have now recorded were made with a jet of the 33rd of an inch; not because I prefer it, but because I had begun my investigations with it, without being aware of the practical applications to which the results might lead; and, having once begun with it, I thought it better to complete the experiments with it.

Since these experiments were finished, I have performed others,

* Since writing the above, I have fortunately had an opportunity of procuring the coal alluded to, and of preparing gas from it. All the trials were repeated with great care, and were found to give results corresponding with those in the above table, so that there must have been an error in noting the results of the first trials. In the subsequent trials, repeated again and again, the consumpt by meter and calculated by pressure differed only in 40 seconds.

to enable me to find the best jet for the purpose now recommended. I had accordingly jets made with accuracy, the apertures in which were the 25th, 30th, 35th, 40th, 45th, and 50th of an inch; with all of which numerous trials were performed, to ascertain the consumpt and pressure. I soon, however, rejected the first two, because they gave an unsteady flame; while the pressure column in the gauge was not of any great length. With the remainder, the flame was more steady, and more easily measured, while the pressure-column was of sufficient length to be easily marked. I soon, however, also rejected the burner No. 50, because, unless the pressure on the street-pipes is great, it does not give a flame of sufficient height; indeed the same is sometimes the case with jet 45. For these reasons I now prefer the jet 40, because, while it gives a very steady flame at 5 inches, the water-column in the gauge is much longer than when a jet 33 or 35 is used; and thus, any slight inaccuracy, in noting the pressure leads to a smaller error in the results than when the same inaccuracy is committed, in noting the pressure when the water-column is not so long.

The following is the results of trials made with the different jets I have mentioned:—

Trials with Flame.

4 Inches.			5 Inches.		
Jets.	Pressure in 100ths of Inch.	1 Foot burned Minutes.	Jets.	Pressure in 100ths of Inch.	1 Foot burned Minutes.
		′ ″			′ ″
25	15	75 35	30	50	65 25
30	30	75 30	33	68	64 25
33	44	75 41	35	110	65 0
40	90	72 55	40	120	63 40
45	110	72 30	45	155	64 40
50	196	75 0			

On viewing the results above given, it will be observed that the times for the consumpt of one foot are very nearly the same. Had the difference followed any regular gradation, then we might have supposed that it was occasioned by the difference in the size of the aperture in the jet; but, as it does not do so, we may, I think, safely conclude that with jets of different apertures, and with flames of the same height, the quantity of the same gas consumed in the same way is the same; or that the times for equal consumpts are the same. That this is really the case is still further proved by taking a small jet of gas, of given height of flame, and marking the consumpt by meter; then removing the jet from the socket, which is left open, and consuming the gas from it; the quantity, in the same time, will be found to be the same. Or, burn the gas from the latter, with a flame of such a height as can be measured with any degree of accuracy; then introduce a jet, and burn the gas with the same height of flame; the quantities consumed are the same, or as nearly so as can be expected from trials of the kind, where it is difficult to measure accurately the length of flame. Hence, most probably, the cause of the difference of time in the table given; that difference having been occasioned by the flame in some of the trials having been a very little too high or too low, in the cases where the difference is greatest. Even that difference, especially in the last table, the experiments of which were repeated again and again, with slightly varying results, is only 1 min. 20 sec. This shows the necessity of repeated trials, altering the flame, and again bringing it to the fixed height, and each time marking the consumpt and the pressure, so that, by taking the average of many trials, an accurate result may be obtained. Having fixed on the jet 40, bushed with platinum, and furnished with the scale for the flame, and with the pressure-gauge, I found, by numerous trials, that the time for the consumpt of 1 foot of a gas was 64 min. 41 sec., the flame being 5 inches. The pressure at the burner-gauge was $\frac{117}{100}$ths. The specific gravity of the gas was, by experiment in the usual way, found to be 602·6, at 60 deg., and barometer 30; of course 1 foot requiring 64 min. 41 sec., then in 60 min. there are consumed 0·927 of foot. Thus, then, the consumpts being, in equal times, as the square roots of the pressures, and the times for equal consumpts being inversely as the square roots, while the specific gravities are also inversely as the square roots of the pressures, the following table will give the consumpt of gases in 60 minutes, the time for the consumpt of a foot; and the specific gravity, at 60 deg., and barometer 30, calculated from the square roots of the pressures, the gases being consumed with a flame of 5 inches from the jet 40; taking, as I have already stated, a gas of specific gravity 602·6, burning under a pressure of $\frac{117}{100}$ths, 1 foot in 64 min. 41 sec.; the square root of pressure 117 being 108166.

Should any other jet be found preferable, the quantity of gas consumed by it, with a flame of a fixed height, must be ascertained by repeated trials, with an accurate experimental meter; taking the pressure accurately each time. The average consumpt and pressure being thus fixed on, the specific gravity is to be taken by experiment in the usual way; then the consumpts and specific gravity of other gases, with the same burner and height of flame, will be found, as already directed, with jet 40; and for which the table has been constructed.

Table, *showing the Times for Equal Consumpts, the Consumpts in Equal Times, and the Specific Gravities of Gases, requiring the following Pressures to burn them, from Jet 40, with a 5-Inch Flame.*

Pressure in 100ths of inch.	1 Foot burns Min.		100ths of Foot in 60 Mins.	Specific Gravities, Air=1000.	Pressure in 100ths of inch.	1 Foot burns Min.		100ths of Foot in 60 Mins.	Specific Gravities, Air=1000.
	′	″				′	″		
60	90	18	66·6	841·4	131	61	8	98·2	569·5
61	89	36	66·9	834·5	132	60	54	98·6	567·3
62	88	48	67·5	827·7	133	60	36	99·0	565·2
63	88	10	68·0	821·2	134	60	27	99·3	563·1
64	87	28	68·5	814·7	135	60	12	99·6	561·0
65	86	48	69·1	808·4	136	60	0	100·0	558·9
66	86	8	69·6	802·3	137	59	45	100·3	556·8
67	85	30	70·1	796·3	138	59	33	100·7	554·8
68	84	48	70·6	790·4	139	59	21	101·1	552·8
69	84	15	71·0	784·6	140	59	8	101·5	550·8
70	83	36	71·7	779·0	141	58	54	101·9	549·0
71	83	0	72·2	773·5	142	58	42	102·3	547·0
72	82	30	72·6	768·1	143	58	30	102·6	545·1
73	81	54	73·2	762·8	144	58	18	102·0	543·2
74	81	21	73·7	757·8	145	58	6	103·3	541·3
75	80	48	74·1	752·6	146	57	54	103·7	539·4
76	80	16	74·5	747·6	147	57	42	104·0	537·6
77	79	15	75·1	742·8	148	57	30	104·3	535·8
78	79	14	75·7	738·3	149	57	18	104·6	534·0
79	78	44	76·3	733·3	150	57	6	104·9	532·2
80	78	12	76·7	728·7	151	56	54	105·4	530·4
81	77	42	77·2	724·3	152	56	45	105·8	528·7
82	77	12	77·7	719·8	153	56	33	106·1	527·0
83	76	48	78·1	715·4	154	56	19	106·4	525·3
84	76	12	78·7	711·1	155	56	12	106·8	525·6
85	75	54	79·1	706·9	156	56	0	107·1	521·9
86	75	24	79·5	702·8	157	55	48	107·4	520·2
87	75	0	80·0	698·8	158	55	39	108·0	518·5
88	74	36	80·4	694·0	159	55	30	108·4	516·9
89	74	6	80·9	690·9	160	55	19	108·8	515·3
90	73	45	81·4	687·0	161	55	9	109·7	513·7
91	73	18	81·7	683·3	162	54	59	109·1	512·1
92	72	57	82·1	679·5	163	54	48	109·4	510·5
93	72	34	82·5	675·8	164	54	38	109·7	508·9
94	72	6	83·1	672·3	165	54	29	110·1	507·4
95	71	48	83·5	668·7	166	54	19	110·4	505·9
96	71	24	83·9	665·2	167	54	9	110·8	504·4
97	71	0	84·1	661·8	168	53	59	111·1	502·9
98	70	36	84·9	658·4	169	53	50	111·5	501·4
99	70	18	85·3	655·1	170	53	41	111·8	499·9
100	69	58	85·7	651·8	171	53	31	112·0	498·4
101	69	36	86·2	648·6	172	53	21	112·5	497·0
102	69	12	86·7	645·4	173	53	12	112·7	495·6
103	68	54	87·1	642·2	174	53	3	112·9	494·2
104	68	36	87·5	639·1	175	52	54	113·3	492·8
105	68	15	87·9	636·1	176	52	45	113·6	491·4
106	67	58	88·2	633·1	177	52	36	114·0	490·0
107	67	36	88·6	630·1	178	52	27	114·3	488·6
108	67	18	89·1	627·2	179	52	18	114·7	487·2
109	67	0	89·5	624·4	180	52	9	115·0	485·8
110	66	42	89·9	621·5	181	52	0	115·3	484·5
111	66	24	90·3	618·6	182	51	52	115·5	483·2
102	66	6	90·7	615·9	183	51	43	115·8	481·9
113	65	48	91·0	613·2	184	51	34	116·2	480·5
114	65	30	91·4	610·5	185	51	27	116·6	479·2
115	65	15	91·9	607·8	186	51	19	117·0	477·9
116	64	58	92·3	605·2	187	51	12	117·3	476·6
117	64	41	92·7	602·6	188	51	2	117·6	475·3
118	64	24	93·1	600·0	189	50	54	117·9	474·1
119	64	9	93·5	597·5	190	50	46	118·2	472·9
120	63	48	93·9	595·0	191	50	37	118·5	471·6
121	63	36	94·3	592·5	192	50	30	118·8	470·4
122	63	21	94·7	590·1	193	50	22	119·0	469·2
123	63	6	95·1	587·7	194	50	14	119·4	468·0
124	62	50	95·4	585·3	195	50	6	119·7	466·8
125	62	35	95·8	582·9	196	49	59	120·0	465·6
126	62	18	96·2	580·6	197	49	51	120·3	464·4
127	62	6	96·6	578·3	198	49	44	120·7	463·2
128	61	51	97·0	576·1	199	49	36	120·9	462·0
129	61	36	97·4	573·9	200	49	29	121·1	460·8
130	61	21	97·8	571·7					

Before concluding I wish to advert briefly to a mode of fixing the illuminating power, which, so far as I am aware, has not been publicly noticed in any of the papers lately printed. Dr. Lyon Playfair, who described it to Mr. King, of the gasworks, Liverpool, from whom I first got the account of it, ascribes it to Pro-

fessor Bunsen, of Marburg; and accordingly, as I understand, he has the merit of proposing it. It consists of a sheet of paper besmeared with spermaceti, excepting at a small part at the centre, by which the besmeared portion becomes more pervious than the other to light; and consequently a light placed behind it causes a dark spot on that part not covered. When another light is placed before the paper, the spot is distinctly visible, if that light be placed at such a distance as to cause the reflection from the paper to be either of greater or of less intensity than that transmitted. When, however, it is so situated that the transmission from behind, and the reflection from before, are of the same intensity, then the spot is invisible; the paper appears as if uniform throughout. Now, with a light of uniform intensity placed behind, the transmission will always be the same. If another light before the paper requires to be at the distance of 5 inches, and another at 10 inches, to cause, one after the other, the spot to disappear, then, according to the usual law, they are giving light as 25 and 100, *i. e.*, 1 to 4. After a little practice I have found this photometric process extremely delicate. It has many advantages over the shadow test: for instance, the difference in the colour of the shadow is avoided; besides, the trials can be conducted without darkening the room, unless there are cross lights or sunshine directly into the apartment.

With regard to the light to be placed at the back of the screen, the only uniform source with which I am acquainted is a wax or spermaceti candle, of the same diameter, and with the same thickness of wick. With regard to the modes of preparing the paper, I at first used spermaceti melted, as recommended by Mr. King, and applied it to bibulous paper in various ways; but I never succeeded in gettting it uniformly spread over the surface,—it was generally thicker at one part than at another, which gave rise to a difficulty in fixing the distance at which the light should be placed. After trying different methods, I have, however, succeeded in getting the paper properly prepared. The process I now follow, is to dissolve spermaceti in distilled oil of naphtha till it gives a mixture, which at natural temperatures is solid; but is liquefied by the application of *a very slight heat*, such as by holding the vessel in the hand for some time. When fluid, it is to be applied by a hair-pencil to the paper, leaving a part about the size of a half-crown piece at the centre uncovered. After this the paper is held *horizontally* over a lamp, *and very cautiously heated*, by which all inequalities disappear. I prefer the fine cream-coloured paper now much used as letter paper.

A screen fitted up in this way, stretched on a frame, with a holder for a light at the back, and with another holder in front for the other light, is all that is required; of course, if gases are to be tried, the holder in front must be furnished with a jet of the diameter previously fixed on, and with a flexible tube to be connected with the gaspipe. This holder can be made to move backwards and forwards on a scale graduated to inches, with their corresponding squares; or to lights of candles, as may be thought proper. To make the apparatus more complete, the gas-jet can be furnished with the pressure-gauge, which I have recommended for ascertaining the durability; and thus, by the two together, the *value* of gases might be quickly ascertained.

This mode of trying the illuminating power will be found very useful, not that I prefer it to the chlorine test, because, by the latter, all gases can be compared with a standard of unity, the illuminating power being just as the condensation; but because the former is easily managed, especially by those not practised to work with water-troughs. Could a truly uniform source of light be procured, and, by general consent, be fixed on, as that for the back of the screen, then the light from gases, or indeed from other sources, could be compared with it; but as yet we are not, so far as I am aware, in possession of such a light.

With the use of the screen now described, I was anxious to repeat the trials made, with the view of ascertaining the light for equal consumpts of gases by different burners; an account of which was published in "The Transactions of the Society for 1842," because I have again and again heard the accuracy of these results called in question. In conducting the trials, I had, as before, recourse to an experimental meter to ascertain the consumpt, and made use of a gas-jet flame, always of the same height, always at the same distance from the back of the screen. Each series of trials being conducted in one day, the gas was, of course, of the same quality for each day, by which a uniform transmission of light from behind was obtained.

The following are the average results:—

Burners.	Consumpt in 60 Minutes.	Light by Flame.	Light for equal Consumpts.
	Feet.		
Jet—flame 5 inches	1·00	1·00	1·00
Small Fishtail.....	1·98	2·89	1·45
Large Fshtail.....	2·60	4·00	1·53
Small Batwing	3·00	4·40	1·46
Large Batwing	4·60	8·40	1·87
Argand, 40 holes	4·50	7·84	1·74

In the paper published in 1842 it was stated that the most profitable way of consuming gas is by the argand, properly constructed; in other words, that for equal consumpts the greatest amount of light is given by the argand; next, by the batwing; then by the fishtail; and, lastly, by the jet, which is the least economical; and, consequently, lighting by gas is, comparatively, for equal amount of light, by far most expensive to those having recourse to this mode of burning it, such as to those requiring small quantities. The light, as then stated, was in the ratio of 100, 140, 160, 180. In the trials now recorded the results do not all correspond with these. With the small fishtail and the argand they do so very nearly; the burners used having been the same as formerly. The others, such as the large fishtail, not formerly tried, is more economical than the small fishtail; the small batwing, also not formerly tried, is not more economical than the small fishtail, and much less so than the large fishtail. The large batwing, the largest I have ever seen, is equally economical with the argand: I found it very liable to smoke. The general results of these trials may, however, be said to correspond with those previously given, proving the accuracy of my former statement, that the jet is the worst kind of burner, giving least light for the same consumpt; next come the fishtails, generally speaking; then the batwings of medium size; and, lastly, the argand.

GAS LIGHTING IN PARIS.

The following is a translation of the contract between the municipal authorities of Paris, and the several gas companies of that city:—

Section I.

Article 1.—The city of Paris, under the reserve of its rights, as defined by the resolution of the Préfet of the Seine, dated Oct. 30, 1844, concedes to the English, French, Parisian, Belleville, Lacarrière's, and the Western Companies the right to preserve and lay under the streets comprised in the districts hereafter mentioned, pipes for the supply of gas, which have hitherto only been laid in virtue of simple, revocable authorizations.

This privilege is granted for the term of seventeen years, commencing on Jan. 1, 1847, and ending on Dec. 31, 1863. At the expiration of these seventeen years, the authorities will be at liberty to provide as they may judge best, for the future lighting of the city of Paris.

The city of Paris reserves to itself the right to displace, or even to remove, without any indemnity, the pipes of the companies, whenever the authorities may judge that the public service requires it.

During the continuance of the present concession, the authorities shall also have the right to make experiments on any new system of lighting that may be produced, limited to 1000 yards in length, at such parts of the companies' districts as they may point out, without any indemnity to the said companies.

The districts of the several companies are fixed as follows:—

(Here follows the list of companies, with the districts assigned to each, which is of no interest to the English reader.)

Art. 2.—The companies hereafter mentioned engage, each one for itself, to furnish gas during the seventeen years of the concession, both for public and private lighting, at the prices and under the conditions annexed.

Section II.

Regulations common to both Public and Private Lighting.

Art. 3.—The gas used for lighting shall be extracted from coal. The companies shall use no other gas, without the formal consent and written authority of the Préfet of Police.

The gas shall be perfectly pure, its purity being ascertained by the means which the authorities shall prescribe, conformably to the regulations of Article 23 of the royal ordonnance of Jan. 27, 1846.

Art. 4.—Whenever they shall be so required by the Préfet of Police, the English Company, the French, Lacarrière's, the Parisian, the Belleville, and the Western Companies shall be bound to lay down pipes, at their respective costs, for any public or private lighting which the authorities may wish to establish, to an extent not exceeding 10,000 yards per annum for the Parisian Company, 5000 yards per annum for the Belleville Company, and 1500 yards per annum for the Western Company. The dimensions of the mains and branches laid or to be laid, and the pressure of the gas at all parts of the district, shall be so combined that each light, public or private, may receive the quantity of gas necessary for the normal lighting defined in Articles 9 and 40, even in the case where a meter is used.

The disposition of the main pipes and branches which may be placed by the companies, and the pressure of the gas requisite to be maintained in the mains, shall be governed by the demand for public or private lighting; and Experimental burners and meters, or pressure-gauges, shall be placed, at the expense of each company, at the points of their several districts indicated by the authorities.

In default of the companies conforming to the regulations of this article, and to the instructions given to them on this head, they may be carried into effect by the authorities at the expense of the companies, independently of the fines fixed by Article 32.

Art. 5.—To ensure the regular service of the public and private lighting with which they are charged, the companies shall be bound

to have constantly in store and in transit, two months' supply of the materials necessary for gas making.

Every three months the proper amount of this stock shall be determined by the Préfet of Police, in proportion to the number of lights that the company shall have to supply, both public and private.

This stock shall be verified whenever required by the authorities.

As to that which concerns the supplies in course of transit, account shall only be taken of them when the navigation is uninterrupted, and bills of lading for the quantity are produced.

Section III.

Public Lighting.

Art. 6.—The public lighting includes all the public thoroughfares now existing, or which may be made, as also all public establishments in the city of Paris which may be indicated to the companies as such by the authorities, during the continuance of the present concession.

Art. 7.—In case any of the gas companies should, from any cause whatver, be unable to supply all or any of the districts in which its mains are laid, the neighbouring companies, who may be so required, engage, under all reserve of their remedy against the company which may have called upon them for assistance, to provide for the public lighting where necessary, as may be indicated by the Préfet of Police.

For this purpose, and to prevent any interruption in the public lighting, the pipes of each company shall be so disposed, that in case of need they may be put immediately in communication, at the points indicated by the authorities, with the mains of the company of the adjoining district.

Each company binds itself to execute, in conjunction with the neighbouring company, and at the common expense of these companies, the necessary works for the establishment of these communications, one month after the signing of the present agreement.

These works will be carried out under the directions of the Préfet of Police, and the superintendence of the agents of the authorities, who may proceed to execute them themselves, if the companies do not do so in the period prescribed.

Art. 8.—In the case foreseen by the preceding article, the companies engage to light at a proper pressure; but, during the first month of the supplementary lighting, they shall not be responsible for the weakness of the light, either in their own district, or in that of the companies which they replace.

They shall only supply the private lights of the company which they replace, after the public lighting shall be provided for; and only then with the approbation of the Préfet of Police. They shall employ the necessary means to prevent the private consumers of the company, whose operations are suspended, from unduly using gas supplied to the mains of the said company. The authorities on their part will publish restrictions against taking any supply of gas on the said lines of mains, not authorized by the auxiliary companies and the municipal authorities.

Art. 9.—There shall be three classes of batswing burners for public lights. The dimensions of the flame of the first class shall be 2¼ inches wide and 1⅛ inch high.

This burner shall be paid for at the rate of ·234d. per hour to the English, the French, and Lacarrière's Companies; and at ·336d. to the Parisian, the Belleville, and the Western Companies.

The flame of the burners of the second class shall be 2½ inches wide and 1¼ inch high.

This burner shall be paid for at ·328d. per hour to the three first companies, and ·470d. per hour to the other three.

The flame of the burners of the third class shall be 3¾ inches wide and 1⅞ inch high.

This burner shall be paid for at the rate of ·468d. per hour to the first three companies, and at ·671d. to the other three.

The above prices have been fixed according to an estimated mean consumption per hour of 3½ feet for the first class, 4 9-10ths feet for the second class, and 7 feet for those of the third class.

When the gas for the public lights is sold by meter, it will be paid for at the rate of 5s. 9d. per 1000 feet to the first three companies, and at 7s. 10d. per 1000 feet to the other three companies.

Art. 10.—Whenever the authorities may wish to employ burners of a larger size than the third class, or an intermediate size to the three before described, the companies engage to supply them at a price proportional to those above established.

Art. 11.—The model of the burners used, shall be determined by the Préfet of Police, who alone will have the right to change them; without, however, causing any augmentation in the consumption of gas. These model burners shall be deposited at the Prefecture of Police, and at the offices of the respective gas companies,

Art. 12.—The public lighting is divided into three classes—permanent, variable, and irregular.

The burners of the "permanent" lighting are lighted throughout the year from the evening to the morning without interruption.

The "variable" lights are those which are interrupted during the full moon, whether it lasts the whole or only part of the night.

The "irregular" lights are those of which the time of lighting varies on account of the wants of the localities where they may be placed. The nature of these different burners will be fixed by the Préfet of Police, who will always have the right to modify them.

Art. 13.—The hours for lighting and extinguishing the "permanent" lights and the "variable" lights, shall be determined by a table drawn up at the commencement of each year by the Préfet of Police, and printed at the expense of the authorities.

The hours of lighting and extinguishing the "irregular" lights shall be regulated according to circumstances by the Préfet of Police.

Art. 14.—The time employed in lighting shall occupy at the most forty minutes; *i. e.*, it must commence twenty minutes before the time specified in the table, and must finish, at the latest, twenty minutes after that hour.

Art. 15.—The companies shall each month submit the rounds of the lamplighters to the authorities, who shall have the power to make any changes, to which the companies shall be bound to submit. When these rounds have been approved of by the Préfet of Police, the companies shall in no way modify them without the consent of the authorities.

Art. 16.—In case of fogs or other unforeseen events, the duration of the lighting may be prolonged as circumstances render necessary.

The "permanent" lighting, indeed, may be temporarily substituted for the "variable" lighting. The companies are bound to execute all the orders given on this account by the Préfet of Police; and they cannot claim other or larger indemnity than that caused by the prolongation of the hours of lighting, or an increase in the number of burners.

Art. 17.—The companies shall furnish two lamplighters, to accompany the inspectors of the authorities in their rounds both by day or night.

These lamplighters shall be provided with a lighted lantern, keys for cocks, and all other necessary artcles; and ladders if required.

A badge shall be given to them by the authorities, at the expense of the companies, so that they may be recognised in their rounds.

This badge shall bear a number, and shall always be so worn, that it may be visible.

The companies shall deposit at the Board of Health and Lighting, and at the police courts and other places to be pointed out, the proper number of ladders, keys, and other articles necessary for this service.

Art. 18.—Each month the companies shall furnish a list of the names and abodes of persons employed by them. These lists, together with those required by Art. 15, shall be transmitted to the Board of Health and Lighting on the 1st of each month.

Art. 19.—The Préfet of Police shall have the right to require the dismissal, either temporary or definitive, of such lamplighters and other servants of the companies, as may give occasion for complaints which he may judge well founded.

Art. 20.—The lanterns, and the posts or brackets supporting them, shall be furnished by the authorities to the companies; who shall fix them, and cause them to be painted of such colours as the Préfet of Police may direct. The companies shall furnish and fix the services, cocks, burners, and, generally, everything necessary to complete the gas lighting.

Art. 21.—The expense of fittings required from the companies by the preceding article, shall be advanced by them, and repaid by the authorities, upon certificates given by the surveyors nominated by the Préfet of Police.

The companies shall lay on the services as the execution of the works advance.

Art. 22.—The companies shall be bound to lay the services which shall be demanded, and to light the new lights, within the periods fixed by the Préfet of Police, after they have been ordered.

Art. 23.—The companies shall maintain in good repair all the apparatus which shall be fixed by them, or which is actually in service in their districts. They shall immediately repair any leaks that may be discovered in the pipes, cocks, or other accessories.

They shall immediately replace, on the first notice given them by the authorities, the broken glasses, and generally all articles requiring repairs. The cracked or damaged glasses shall also be replaced by the companies, when required to do so. The companies shall be responsible, except in the case of "*force majeure*," for all the accidents that may happen to their property. They shall also be responsible for thefts committed on it, even when they can prove that all possible means have been taken to prevent them. The "*proces-verbaux*," which shall be drawn up on this head by the police, shall serve, if necessary, as evidence to the companies to claim from the authors of such damage the cost of replacing it, without the authorities being ever liable on that account.

Art. 24.—The companies shall clean the lanterns daily. This cleaning shall always end one hour at least before lighting.

They shall wash the lamp-posts their whole height, from the 25th to the 30th of each month.

Art. 25.—In the month following the signature of the present contract, a general numbering of the lights shall be made at the expense of the authorities. The numbers and distinctive marks shall be inscribed on a plate, according to a model to be determined upon by the Préfet of Police.

Art. 26.—The companies shall maintain the painting of these

numbers, and renew, as necessary, the plates, which shall always be in a good state: the inscriptions being always legible.

Art. 27.—The companies shall repaint, when required so to do by the Préfet of Police, the lamp-posts and brackets, of such colours as shall be directed.

Art. 28.—All the expense resulting from the carrying out of the Articles 17, 23, 24, 26, and 27 shall be at the cost of the companies. The authorities shall allow 4d. per day per light for these expenses.

Art. 29.—The companies shall execute all the removals or alterations of lamps within such periods as the Préfet of Police may require. The cost of these alterations or removals shall be advanced by the companies, and repaid by the authorities in the manner indicated by Art. 21.

The materials removed shall be deposited in the warehouses of the authorities.

Art. 30.—In default of the companies conforming to the regulations of Articles 22, 23, 24, 26, 27, and 29, and to the requisitions that may be made to them on this head; they may be made at their expense by the authorities, independently of the fines fixed by Art. 32.

Section IV.

Fines.

Art. 31.—The companies bind themselves to fulfil their engagements punctually, under pain of damages.

In the cases hereafter mentioned, the damages shall be borne in the shape of a fine, and shall be retained from the sums becoming due each month, to the companies who shall have incurred the fines.

Art. 32.—These fines shall be fixed in the following manner:—

1st. For each light which, in the case foreseen by Art. 7, shall not be lighted, the fine shall be, for the first night, equal to the price for the service of the light during the whole night; it shall be double for successive nights.

2nd. For each light of which the flame shall not have the specified dimensions, the fine shall be double the price for the lighting of the light throughout the night. (Art. 9.)

This fine shall be reduced one-half when the defect shall have been rectified during the first hour of lighting, and the cause of it shall have been satisfactorily proved.

3rd. For each burner that is not of the model prescribed by the Préfet of Police, the fine shall be 12s. (Art. 11.)

4th. When the lighting is not completed in any of the parts of the town confided to the companies, at the hours prescribed in the tables of lighting, and conformably to Art. 13, the fine shall be for each half hour's delay 1s. 7d. per light.

It shall be 9½d. per light per half hour, if the delay takes place with two or a greater number of lights following each other.

If the delay is only with single isolated burners, the fine shall be 4¾d. for each burner each half hour.

There shall be the same fines, and in the same proportions, for each half hour's premature extinction.

They shall, however, be reduced one-half when the lights extinguished prematurely shall be relighted, and the cause shall have been satisfactorily proved.

5th. The fine shall be 9½d. for each lamplighter who does not follow the prescribed round.

6th. If, in the case provided for by Art. 16, a company should not comply with the orders that may be given, it shall be liable to a fine of double the price of the night's lighting, for each light that is not lighted at the appointed hours.

7th. There shall be a fine of 2s. 9d. for each lamplighter who shall not have been placed at the disposal of the agents of the authorities, as prescribed by Art. 17.

If these lamplighters have not been provided with the articles specified in the said article, they shall be considered as not having been furnished, and the fine shall be imposed. It shall also be imposed if they have not a badge, or if it is not worn conspicuously.

8th. For each day's delay in the return of the plans of districts, and of the staff of the companies, the fine shall be 4s.

9th. It shall be 4s. for each servant employed after dismissal, conformably to Art. 19.

10th. Each company shall bear a fine of 4s. for each day's delay which shall occur in putting any lights in service, beyond the time fixed for such work, conformably to Art. 22.

This rule is applicable to the suppression or removal of lights, as the Préfet of Police may prescribe in virtue of Art. 29.

11th. Each company shall bear a fine of 9½d. per day for each light, in the service-pipe of which a leak shall remain unrepaired, after notice given to the company. (Art. 23.)

12th. The fine shall be equally of 9½d. per day for each lamp, the broken, cracked, or damaged glasses of which are not replaced after the first notice given by the director of health and lighting. (Art. 23.)

13th. A similar fine for each lantern that shall not be cleaned at the hours fixed in Art. 24.

14th. A similar fine for each lamp-post that has not been washed at the periods fixed by the same Art. 24.

15th. A similar fine for each plate wanting, or in a bad state, or of which the numbering is effaced, illegible, or incomplete, and has not been repainted, after notice conformably to Art. 26.

16th. The same fine for each lamp-post or bracket which shall not have been repainted after notice, as prescribed by Art. 27.

17th. The company which shall not have in store the stock determined by Art. 5, shall bear a fine of £19. 16s. per day for each tenth part of such stock wanting to complete the quantity, for the English, French, and Lacarrière's Companies; and of £9. 18s. per day for the Parisian, Belleville, and Western Companies, for each tenth part wanting to complete their stock.

18th. For each day on which the purity of the gas is not equal to the degree prescribed by Art. 3, the fine shall be for each of the companies in default, £19. 16s. for the first conviction, £27. 6s. for the second, and £39. 12s. for the third, proved within the space of thirty days.

19th. The company which shall refuse to execute all or any of the requirements of Art. 4 shall bear a fine of £1. 19s. 6d. per day per 100 yards running of pipes and branches not laid down at the periods specified by the said article, or not in a manner conformable to its requirements.

Art. 33.—All the fines shall be determined by the Préfet of Police, from the reports of the servants of the authorities, for each case proved. The companies may daily, except on Sundays and public holidays, inspect or take copies of the reports at the offices of Health and Lighting. The reports proving insufficiency of flame, should state, as nearly as possible, the amount of such deficiency.

Art. 34.—The amounts payable to each company for the lighting, shall be fixed, as to the price for gas, by the number of hours which each light shall burn; to these sums shall be added the charges allowed by Art. 28. The payments shall be made monthly; the fines for the infraction of the rules of the present contract, and the expenses of executing any work, being retained.

Art. 35.—The sums due to each company for fixing new lights, removing or altering old ones, and for all other works liable to be allowed for, shall be paid during the month following the definite arrangement of such claims made in the form prescribed by the Article 21.

This settlement shall be made, at the latest, three months after the presentation of such claims.

Section V.

Private Lighting.

Art. 36.—Each company shall be bound, within its district and in localities where mains already exist, to furnish gas to every person who will contract for three months at the least, and who shall fulfil the rules and requirements concerning the laying of the services, &c. The form in which these contracts are made shall be approved by the authorities.

The contracts at per light may be made for every day without exception, or without Sundays and fête-days.

No one can be refused a supply of gas, but the companies may demand monthly payments in advance.

Art. 37.—The gas may be furnished either by meter, or by contract, at the will of the consumers. The meters shall be provided by the consumers, who may employ their own men to fix and maintain them.

The sort of meters adopted shall be approved by the authorities. They shall be submitted to such trials as the authorities may prescribe, so as to ascertain their exactitude, without prejudice to any the consumers or the companies may wish to adopt.

If the authorities shall not have determined upon the mode of testing, the meters shall not be fixed until they have been verified both by the companies and the consumers.

Each company shall have the right to choose the system of meters, amongst those of which the authorities have approved; but the *exclusive* use shall not be confined to any system of meter, the manufacture of which is not open to the public.

A model of each system of meter, approved of by the authorities, shall be deposited at the Prefecture of Police.

The consumers by meter shall have the free disposal of the gas that has passed the meter; they may distribute it as they desire, either in the interior or on the exterior of the house; but in case the number of burners is increased, the company shall not be liable to any action on account of the weakness of the light.

Art. 38.—On and after the 1st day of January, 1847, the price of gas sold by meter shall be 11s. per 1000 feet, reducing 2¾d. yearly until it has reached 8s. 11¼d. per 1000.

Art. 39.—The prices for the gas sold by the hour, with argand burners, shall be reduced from the 1st of January, 1847, in conformity with a table contained in Art. 43, until it has reached ·57d. per hour for the lights extinguished at ten o'clock, and ·53d. for those extinguished at eleven and twelve o'clock.

Art. 40.—The burners applicable to the above tariffs, shall be argands pierced with 20 holes of $\frac{1}{76}$ of an inch diameter; the height of the flame shall be 3⅛ inches; that of the glass chimney shall not exceed 8 inches. The consumption per hour of these burners shall average 4¼ feet.

A model of the burners, with glasses and holders, and other accessories, shall be deposited at the Prefecture of Police.

Art. 41.—The price for all other burners than those above mentioned, or for lighting at other than the above specified hours, shall be specially agreed between the companies and the consumers.

It shall be the same for the 20-hole argands placed outside the house.

Art. 42.—The consumers cannot enforce a supply of gas, either by meter or by contract, except where the pipes of the companies are charged for the public lighting; the conditions for the supply of gas at any other time, shall be specially agreed upon between the companies and the consumers.

Art. 43.—In pursuance of the preceding rules, the tariffs for the sale of gas to private consumers, either by meter or by burner, shall be regulated for each of the seventeen years of the concession by the following table:—

Years.	BY MEASURE. Price per 1000 feet.	BY CONTRACT. From sunset to ten o'clock, per hour.	BY CONTRACT. To eleven or twelve o'clock, per hour.
1847	11s. 0d.	·621d.	·565d.
1848	10 9¼	Equal gradual reduction between these points.	Equal gradual reduction between these points.
1849	10 6½		
1850	10 3¾		
1851	10 1		
1852	9 10¼		
1853	9 7½		
1854	9 4¾		
1855	9 2		
1856	8 11¼	·57d.	·53d.

The companies shall be bound to allow their present customers, if they so require, the advantages of the above tariff, and all others resulting from the conditions of this contract. Consequently they cannot enforce against them any clauses of the now-existing contracts, which may be contrary to those made by the present contract.

The companies shall immediately allow any contract consumer, to burn by meter, if he shall so desire.

Section VI.

General Conditions.

Art. 44.—If, during the term of the seventeen years of the concession, a company was, from any motive whatever, to cease its operations, or not be in a state to continue them, the authorities would immediately have the right to take possession of the works, mains, stock in hand, and, in general, of everything employed in the service of either the public or private lighting.

In case the authorities should make use of this power, they would continue to carry on operations at the expense and risk of the company.

Art. 45.—The companies shall not be able to assign all or any part of their lighting without the formal consent and written authority of the Préfet of the Seine and the Préfet of Police.

Art. 46.—The present concession may be withdrawn from such companies as do not conform to the rules of Articles 3, p. 1; 4, 36, 37, 38, 39, 43, and 45; and in this case, the authorities shall take such measures as they may think best for the public and private interest.

Art. 47.—At the expiration of the term of this concession, the city of Paris shall become proprietor, as a matter of right, by purchase, and shall enter into possession of the pipes, cocks, and other accessories which shall then exist under the public thoroughfares.

Art. 48.—The value of this purchase shall be fixed, in the fourteenth year of the concession, on the basis established in the following table, without, in any case, this operation suspending or retarding the transmission of the property, or the taking possession of it at the expiration of the term of the concession.

Table of the Price of Mains in Cast Iron, and Sheet Iron coated with Bitumen, and of other Apparatus placed under the Public Thoroughfares, including the Expense of Laying.

1st.—Mains.

Diameter. inches.	Price per yard.* In Cast Iron. £	s.	d.	Price per yard. In Bitumen. £	s.	d.
1⅛	0	6	10	0	5	10
2	0	8	4	0	7	2
3	0	10	0	0	8	0
4	0	12	7	0	9	9
5	0	14	11	0	10	5
6	0	17	0	0	12	7
7	1	0	10	0	15	4
8	1	4	3	0	18	1
9	1	9	4	1	0	7
10	1	12	3	1	3	1
11	1	15	9			
12	1	16	5	No larger bitumen pipes are used.		
14	2	8	7			
16	2	14	4			
20	3	6	6			

* The prices of cast-iron main pipes in Paris varies from £10 to £12 per ton.

2nd.—Articles connected with the Mains.

	£	s.	d.
Cast-iron syphons of all diameters .....each	5	10	0
Brick cistern round valves	15	17	0
Ditto do. at the entrance of pipes into Paris	39	12	0
Valves at 17s. per inch diameter—that is for a valve of 6 inches diameter, which is about the mean.....	5	2	0

Art. 49.—The value of the articles mentioned in Art. 47 shall be fixed according to the expenses of supply and laying down, agreeably to the tariff contained in the preceding table, but deducting 70 per cent. on the amount of all materials laid previously to Jan. 1, 1846, and 40 per cent. only on all that may be laid or renewed since that period.

Art. 50.—This sum will be paid to the companies in three equal yearly payments, from the expiration of the concession, with interest at four per cent. per annum from that period.

Art. 51.—The expenses of stamps and registration of the present contract, shall be borne, half by the city of Paris and half by the companies.

Art. 52.—The present contract shall not be definitive, until it has received the approbation of the superior authority.

Correspondence.

CLAY RETORTS.

Sir,—I have read, with a great deal of interest, all that has appeared in the Journal of Gas Lighting on the subject of clay retorts, and can understand the prejudice that exists against them. I was once as prejudiced against them as any one could be, but am now a thorough convert, not to clay retorts as generally made, but to those which are made under my own inspection, and of which I have manufactured 600 since December last. They are as superior to iron retorts, in every particular, as it is possible for one material to be to another. You know me to be a practical man, and you know that I have had some experience, and that I do not form an opinion lightly; and I have not the slightest hesitation in asserting that clay retorts must and will supersede iron in every establishment that is conducted by a man of only ordinary understanding. For the last twelve months we used nothing else here. We have already set 200 elsewhere, and before twelve months have elapsed I hope that no gas works where I have any interest will have an iron retort upon it. I have had, however, much to contend with in their introduction.

I do not feel at liberty to give any details as to our workings with clay retorts, but I can assure you that they are decidedly superior in every respect to those with iron, and to such an extent as would surprise you. It may be that our iron retorts were worse than those used in London; it may be that that our clay retorts are better than others; all these are points that interest me but little; enough for me to know that we have an extraordinary advantage with clay retorts. Those that you have seen were not meant for sale; they were sent to a friend, because he was kind enough to undertake to give them a fair trial; and I was extremely anxious to have such a trial made, because I hope thereby to remove the prejudice that exists in London, and which impedes, to some extent, my efforts for the general introduction of them. I have given great attention to the subject for the last twelve months. I have completely changed the system of setting the retorts. No more arches—no more humps or guard tiles! The ovens are all retorts and fireplaces. I put seven clays to one fire in the same ovens where I used to have five irons and two fires. You, as a practical man, will see at once what an enormous advantage this alteration offers; but all this can only be done with retorts made like ours, and the care and labour that are bestowed on the making of them must be seen to be believed.

Your correspondent, "Aluminium Ferrum," is an intelligent fellow, but it is evident that his clay retorts were *bad*. We work our clay retorts without any exhauster; and in the winter we had always twenty-eight inches of pressure upon them; in summer it falls to twenty-two inches. We neither charge with tar nor breeze; and twenty-four hours after the retorts are at work, the produce per measure and per retort per day attains its standard. We have ten, which have been now at work for thirteen months and a half; they work alone, and produce from 10,000 to 11,000 cubit feet per ton of coal, and 3400 to 3600 cubic feet per retort per day. We have not lost a single retort in getting up the heats; and, upon one occasion, we put a full charge into five, twenty-four hours after the fire was put under them! * * *

CLAY AND IRON RETORTS.

Sir,—I need not occupy the time of your readers nor your valuable columns by replying at length to the letter from Messrs. Frazer and Sanderson in your last number; as it is clear, from their own showing, that the error complained of resulted from a misstatement in their own circular. With regard to my having used uncourteous language to the manager of the Dunfermline Gas Works, I plead not guilty. My remarks were not of a personal nature, and quite within the bounds of fair criticism in a published

document. It grieves me to think that I have been unintentionally the cause of momentary pain to a gentleman who is a perfect stranger to me; for, although I write under a mask, it is not worn for the purpose of inflicting wounds from a secret hand, my disguise being known to several friends whose censure I dread as much as that of the public at large.

There is great difficulty, however impartially one may write on a subject of this kind, which involves the interests and feelings of many, to give entire satisfaction to all concerned. I, therefore, expect replies from men on both sides of the question. Nothing will give me more pleasure than to see the matter well discussed, as being the only means of arriving at truth.

Some reasons were given in my last letter for believing that, *at the same heat*, less gas was evolved from clay retorts than from iron. It is very difficult to form an estimate of the average amount of this loss; practically, this estimate is not required; for as clay is always worked at a higher heat than iron, being better fitted for high temperatures, this loss by leakage is no doubt compensated for by the conversion of a portion of matter into gas, which at lower heats would be retained as tar. This, added to the inferior heat-conducting power of clay, necessarily involves an increase of the fuel account. I will, therefore, consider the quantities of gas obtained per ton of coals as being the same in both cases, and proceed to investigate the fuel required.

In large manufactories five or more retorts are set to one bed, and when a number of beds are joined together, the radiation of heat is so much less than when single beds are used, that retorts may be thus heated with greater economy.

In *some* of the London gas works where iron retorts are used, the consumption of coke as fuel does not exceed one-fifth of the total quantity of coke made, that is, about 2½ cwt. of coke suffices to carbonize one ton of coal. I have no correct data of the *minimum* amount of coke required for clay, under equally advantageous circumstances; but I believe it must require at least 3½ cwt., or more than one-fourth of the coke made.

In small gas works, where, in consequence of the loss from radiant heat and the difficulty of keeping the exact number of retorts at work, consistent with the quantity of gas required at the different seasons of the year, from one-third to one-half of the coke made is used for fuel, even with iron retorts; while with clay the fuel account does not exceed that quantity.

This advantage is gained by the facilities afforded by clay retorts of producing on emergencies a great quantity of gas in a short space of time at high heats, thereby obviating the necessity of putting more retorts in action; the fuel expended in heating additional furnaces, and letting them down again, being in a great measure saved.

In small works, therefore, I consider the advantage to be in favour of clay retorts, to the extent of the saving of the difference of maintenance, which amounts, as already estimated, to 1·15d. per 1000 feet.

In large manufactories the pressure, or the expense of an exhauster to remove the pressure, and the extra fuel required, are decidedly against their use. It then becomes a matter, as expressed by a friend of mine, of "cost of retorts against fuel."

The price of coke has, however, lately been much reduced in nearly all the large towns; and if its average value on the works be ever reduced to 10s. per ton, and one cwt. more coke per ton of coals carbonized is necessary for heating clay retorts than is required by iron ones, it would be an extra 6d. per 1000 feet against a saving of nine times 1·15d., equal to 10·35d. per ton of coals. If, on the other hand, coke be valued at 15s. per ton, the one would nearly balance the other.

I do not think there is a gas work similarly situated to those in London that would at the present time take less than 15s. per ton for coke in large quantities. Here, therefore, and in other large towns, where coke is valuable, and where the disadvantage of heavy pressure exists, the time has not arrived for the introduction of clay retorts, although I believe the period is fast approaching when improvements in their construction, as well as reduction in the price of coke, will cause them to supersede iron.

In taking leave of this subject, which I now do, unless a reply be necessary at a future time, let me apologize for the scanty materials which I have brought in review. The want of statistical facts is the great cause of our ignorance. I say *our*, for the profession is, in my opinion, profoundly ignorant of the most important operations of gas engineering. What is at present much wanted is, not a new work upon gas making, but well-attested facts to determine the truth or error of many of our present systems of working, which information may easily, when well ascertained, be combined in a treatise.

Your journal bids fair to lead to this state of things; and if you could but aid the cause still further, by bringing together the principal engineers into an Institute, we might, with the advantages of oral discussions and practical experiments, witness the rapid advancement of gas engineering as a science.

ALUMINIUM FERRUM.

Legal Intelligence.

WEST KENT SESSIONS.—MAIDSTONE, JULY 6.
(Present - The Earl of ROMNEY, Chairman; and a full Bench of Magistrates.)

THE PHŒNIX GAS COMPANY, APPELLANTS, *v.* THE PARISH OF GREENWICH, RESPONDENTS.

This was an appeal against the poor-rates of Greenwich with respect to the company's property in that parish.

Mr. Deedes, with Mr. Rose, was for the appellants; Mr. Horn, with Mr. Russell and Mr. Barrow, for the respondents.

A discussion ensued between the legal gentlemen as to which party was to commence. After hearing the arguments on both sides, the bench decided that the appellants must open their case.

Mr. Deedes said that this was an appeal against the poor-rates of the parish of Greenwich. They had the power to make rates under their local act, and, therefore, he would not dwell on that point. On the 20th of April, in the present year, a rate had been made, and in that rate the company had been assessed at £5671 in respect to that part of their works situate in the parish of Greenwich. The Phœnix Company was a very large company, and had extensive works in twenty-three parishes. The gas was supplied to those parishes by means of pipes and mains which went into the several parishes; and that part of the works in the parish of Greenwich had been rated at the improved value of the property occasioned by the establishment of the works there. What they would have to ascertain was, the proper and just proportion of the total ratable value as applied to the parish of Greenwich, which had rated the company at £5671, although in the previous rates it was £1680. He should have thought the parish would have shown why the increase had been made. It was against this rate that the company appealed. The difficulty of rating railway companies to the different parishes through which they ran increased. Those companies produced their half-yearly receipts, as required by the statute, to enable the parish officers to make fair rates; therefore the Legislature had evidently thought that was the proper way to get at the ratable value of the property. He was prepared to produce the accounts of the company, and to show by them what was the fair ratable value of the property at Greenwich, and those accounts would be open to his friends to examine and to criticise. There was a short section in the statute relative to the railway companies which stated that the rateable value was what a tenant would give from year to year, making those deductions which were allowed in the statute. He had, therefore, to apply that statement to the present case. It was not like farming or property of that nature, and they must, therefore, arrive at some rent as a basis, and then deduct the allowances authorized by the statute. He would show the gross total receipts of the company for the six months ending at Christmas, 1848, which was previous to making the rate appealed against. He would then show the total expenses of three years, and by that means get at what would be the fair rateable value; then, by deducting the expenses, they would get at the net balance. There would be also deductions of per centage on capital to represent tenants' property, insurance, renewals, &c., by which means they would get at the ratable value of the whole. The next thing to get was the proportionable value of each parish, and then for this particular parish of Greenwich. They would take the stations separately, for in some parishes there was no station—the stations were where the gas was manufactured; now there was one station in the parish of Greenwich. They would have to ascertain the value of that station, with the pipes and mains, and thus get at the rateable value of the works in Greenwich parish. They had two things to prove—the ratable value of the station and also the mains—to get at which they must ascertain the saleable value of the stations and the whole works; then the stations and works separately, which would show what belonged to each parish. As the saleable value of the whole is to its net rateable value, so is the net rateable value of the station at Greenwich. We thus get the net rateable value of the Greenwich station, and proceed to the rateable value of the mains, which we get by taking the average of square yards in all the mains, and as the total number of square yards of the mains in the whole, so is the number of square yards in Greenwich parish; and by this it would be shown that the original rate was sufficient, and that they were now greatly overrated. He would produce the books of the company, and call witnesses to show what was the fair and just rateable value on the basis he had laid down, and which had been made up by competent persons.

James Samuel Burslem examined by *Mr. Rose*.—In am clerk to the Phœnix Company. It is my duty to keep the gas rental accounts. These accounts show the amount received by the company for the whole year. I have recently gone through the books for the six months previous to Christmas, 1848. I produce the account No. 1—it is a correct abstract from the books; the abstract of the trade account; the total receipts paid for gas for six months up to Christmas, 1848; for coke and ammonia sold by the company; and £47. 12s. 8d., a dividend from a bankrupt's estate. They are the total receipts for six months. The other side shows the expenses for the half year, including coals, tradesmen's bills, repair of meters, retorts, salaries, wages, rates and taxes, &c. The total receipts are £44,240. 13s. 9d. less balance of interest. The total expenses are £34,678. 2s. 1d. The accounts Nos. 2 and 3 are correct extracts from the books under my care. No. 2 is the account of the public and private lamps paid for; No. 3 is an account of the meters and rent paid for them. I have furnished these to Mr. Lee, the surveyor, to show the value of the works.

Cross-examined by *Mr. Horn*.—The coals used in six months are about 19,000 tons, amounting to about £15,000, at an average of 15s. per ton. The tradesmen's bills are £4461. 14s. I have gone through the bills. They comprise various articles, such as castings, iron-

mongery, and other things. (The book containing the tradesmen's bills was handed in.) Bills for works constructed go into the plant account, and are not included in the £4461, in which there are no new pipes charged. Castings for all extensions of the works are included in the plant. The repairs of the meters are after they have been out and depreciated, and come back to be repaired. The next item for retorts, £1637, goes to the account for manufacturing gas. The meters go to the trade account as well. The plant account is what the capital is invested in—the fixed capital. I have a detailed account of the tradesmen's bills. The meters are charged originally to the plant account, but not the repairs of the meters. The retorts go to the working account. The meter repairs do not go to the capital. There is a detailed account of the repairs.

Mr. Rose said that in railway cases the plant meant the moveable stock.

Cross-examination continued.—The repairs, depreciation, and fixing, for the last half year, amounted to £1769. I dare say the amount of the preceding half year was the same as the last. We take so much off the value of the meter each half year for depreciation. I dare say the depreciation for the year amounted to £3500. I cannot say exactly. I think it is about that; but the books will show. I could furnish it for the last three or four years by looking to them. The item for retorts, £1637. 3s., is to be carried to the manufacturing account. The item for rent is for the works. I don't know the landlord's name. It is in the ledger. The salaries are £2423, including £500 to the directors. I cannot say if that is according to the act of Parliament, as I do not know the act. The officers' salaries are £1323. Men's wages £7430. The receipts are from the rental paid by the consumers of gas to the company. The amount entered is for what has been paid and what is due, made up to the half year—the whole of what we are entitled to receive—which amount is reduced on the other side by bad debts. That is the total rental, including the use of meters. I have abstracted the meters from that.

The noble CHAIRMAN suggested that, as the witness was only the clerk, he thought he was being asked questions which he did not profess to know.

Mr. Horn said they were placed in this unfortunate position. Here was a clerk who had made out the accounts, and yet, upon being examined, could not explain them. (To the witness): Is there any one that knows more of the accounts than you do?—Yes; the secretary.

Is he here?—Yes.

Mr. Horn said he thought it would be better for his friends to call the secretary now.

Mr. Deedes said that every item in the account was taken from the books, and whoever they called must refer to them. They were all here.

Mr. Horn: Yes; but who has time to refer to them.

Mr. Deedes: What are we to do? We have brought these books here at a great expense. If we had not we should have been taunted with not bringing them; and now we have brought them we are taunted with their being too large.

Witness re-examined by *Mr. Rose.*—The tradesmen's bills, £4600, are composed of a great many items for the repairs of the premises. It is necessary for the company to have a certain number of retorts to manufacture the gas, which are constantly wearing and requiring renewal. They average about twelvemonths.

Mr. William Innes examined by *Mr. Deedes.*—I am deputy-superintendent of the engineering department. I produce an account, No. 4, of the number of public lamps supplied by the Phœnix Company to Christmas, 1848. The total number in the London district is 3476. That district includes fifteen parishes. It also furnishes an account of the number of public lamps in Greenwich district, which is 404, making a total of 3880. The posts, lamps, and fittings are kept in repair by the company, both in the London district and Greenwich. I also furnish an account, No. 5, which contains the names of the stations, coals carbonized, and gas produced for six months to Christmas, 1848. There are three manufactories belonging to the company—one at Bankside, one at Vauxhall, and one at Greenwich. The charge of 19,747 tons of coal is correct. It is taken from the journal in which the daily consumption is entered. That quantity of coal produced 177,768,000 cubic feet of gas, in proportion to the quantities used at each station, the precise quantities of which are given in this account. The main pipes in some of the parishes extend a very considerable distance from the works. They go to Tooting and Camberwell. The latter is a mile and three-quarters from the nearest station, three miles and a half from Bankside, and five miles from Greenwich. The several stations send gas into the same main without limit—I mean without obstruction. There is no separation. I have no means of accurately telling what quantity of gas comes from each station. We have a meter at two stations into which the gas passes and is measured. Those meters are at Bankside and Greenwich. It is a disadvantage that some places supplied are at a considerable distance from the manufactories. The ground rises very considerably from the works in some places where there are main pipes, which requires less pressure for the high grounds, but a greater power to get the quantity of light in the lower grounds, as gas ascends. If the place supplied was near at hand, or on a level, there would be less pressure required. When we get into low grounds there is a greater pressure required, and less on high grounds. A great portion of the Greenwich district is on high ground. The pipes are jointed at nine-feet lengths when the size is over 2½ inches; when 2½ and under, they are jointed at six feet. There is a very great loss of gas from leakage from the whole quantity made—about 22½ per cent., as measured from the works. A large proportion of that leakage is from jointing, and a considerable portion from the condensation of gas. These are the two principal causes. There are also a great many casualties from broken pipes. There is rather under a fourth of the whole quantity lost. The average price of gas in Greenwich is 6s. per 1000 cubic feet for private consumption, as burnt. The public lights are about 4s. 1d. per 1000 cubic feet, as estimated by the general consumption of gas burnt. There are rather over 43,000,000 of cubic feet used for the public lights, which is about a quarter of the whole paid for. About two-thirds of the quantity of gas made is sold for private lights. We do not lose so much by the private lights. The total quantity made in the half year was 177,768,000 cubic feet. There are about 39,943,000 lost by leakage, &c. 90,331,000 feet are sold for private lights. The public lamps are charged about 4s. 1d. per 1000 feet, which amounts to £9840. 1s. 11d. The private lights at 6s. amount to £27,099. These figures are in the account No. 5. The quantity quite corresponds. The mains in Greenwich parish are 45,755 lineal yards of all sizes. Retorts last, on an average, nine or ten months. The total number of mains in all the company's establishments are 431,814 lineal yards of all sizes. Retorts, on an average, last 300 days. The expense of repairing the meters is also very considerable. The total number is 9450. I am not able to give the number in Greenwich. The company pays for the repairs. The meters are of very little service after seven years. In No. 3 account there is a charge for depreciation, which extends over five years. There are considerable residual products: the products of the coal after the gas is got out of it. These consist of breeze, coke, tar, and ammoniacal liquor, all of which are sold subject to great variation of price. The value of the residue in proportion to the coal is about 50 per cent. The figures in 4 and 5 are taken from the books by myself. The account No. 6 is a summary of the street mains, showing 45,755 yards in Greenwich; also as correct an account as can be given of the lineal yards in the whole district, with the sizes of all the bores, each separate. In No. 6 account Greenwich is separate. This account enables me to give the number of yards as correct as possible.

Cross-examined by *Mr. Horn.*—There are, altogether, 210 retorts in the Greenwich works. We reckon five retorts in one arch, which will make 210. The retorts at Christmas, 1848, were all of iron: a few of them are now of clay. On an average there were about 120 worked for a whole year. The gas station at Greenwich is situated on the banks of the Thames and the river Ravensbourne, with a long frontage to each. The wharfs are on the Ravensbourne: there are none on the Thames. There is a place on the Thames where bricks and light goods are occasionally delivered. The whole of the wharfs and gas works are above spring tides. The gas-holder tank is under spring tide about ten feet. The whole of Greenwich parish that is supplied is above spring tide: a very large proportion is on the top of the hill, much higher than the spring tides. This is a great advantage in point of economy, where the works are situated low, as the leakage and condensation are less. It is also a great advantage to be near the works than far off. The parish of Greenwich is not very far off. If you limit the supply to Greenwich parish it can be done to great advantage. I consider the works at Greenwich very well constructed. The leakage and condensation in Greenwich parish would not amount to 22½ per cent.—more than 10 per cent.; but he would not speak to a certainty as to the parish. He would not fix it at much less than 15 per cent.; but that must be taken with a reservation, as he could not prove by figures it was 15. Greenwich is well lighted—about the average of other parishes. The loss upon public lights is more than on private ones, the principal reason of which was that, when the shops were shut, there was a greater waste of gas; but we afterwards reduce the pressure. It was a question of policy that the charge for the public lamps was less than for private ones. Private people have not the same power to bargain as public bodies. I can give an estimate of the gross rental of Greenwich district, but not of the parish. I mean the district, which includes five parishes. I cannot give an estimate of the parish: we have books that show it.

Mr. Deedes said, if his friend would look at No. 2, he would find what he wanted to know.

Cross-examination continued.—The gross rental for private lights in the parish only is £3402. 10s. 11d.; for public lights, £872. The rent for letting out meters throughout our district is £1328 for the half year. We lose about £432 by letting them out, but gain by the correct admeasurement. We look after the meters that are not our own, and there is an expense attending the inspection. We employ two men twice a quarter for that purpose. The company had a stock of meters, for which they could not meet with a ready sale, so they let them, reserving to themselves the power of inspection. With regard to coals, we paid 15s. 4½d. per ton for the last half year. There is very little difference in the expense of the company between the half years ending Midsummer and Christmas.

Re-examined by *Mr. Deedes.*—The expenses of each half year are much the same; but the first half year we had very great expenses. There are three companies on this side of the water, and they all let out meters. If all consumers were to furnish their own meters it would be a very considerable saving of expense to the company. The consumers have the option to find their own meters or rent them from the company. The very large majority prefer to rent them. The map (produced by the respondents) shows the situation of the works at Vauxhall, Bankside, and Greenwich. The mains within the red line may be as well supplied from Bankside or Vauxhall as from Greenwich. The account No. 2 includes the public and private lights in the whole district. In one parish, St. Nicholas, there is no light, nor at St. Paul's, Deptford. Mains pass through both those parishes. What he meant by policy in charging lower for public than private lights was, that it was a great advantage to obtain permission to pass the mains through the parishes, without which they could not supply the private lights. That was the principal reason why he said it was policy to charge the public lights lower. The back part of Greenwich stands on very high ground. The lower grounds require a higher pressure, and that higher pressure affects the whole of the district.

By the COURT.—There are pipes in the parish of Greenwich that supply Lewisham and all the parishes in the Greenwich district.

There is a distinct main that goes from Greenwich to Lewisham without branch pipes.

Re-examination continued.—There are main pipes limited to Greenwich alone. Some pass through to Lewisham. They are all included in the account rendered.

Mr. Charles Lee, architect and surveyor, Golden-square, London, examined by *Mr. Rose*.—I have had much experience in rating metropolitan parishes, chiefly employed by the parish officers. I have seen the accounts marked Nos. 1 to 6, and have also surveyed and valued the buildings in the three parishes where the stations are situated, also the pipes and mains throughout the whole of the district. I have gone over the account carefully. I have deducted the expenses in the accounts from the receipts, and from the balance have made the usual allowances and deductions. I have that account. I have taken the detailed account furnished me as true, as I was informed that it had been audited. Mr. Lee then read the following statement:—

	£	s.	d.
Net balance for 6 months	10,982	6	0
Net balance for 12 months	21,964	12	0
Deductions to arrive at the gross estimated value:—			
5 per cent. on the capital employed by the tenant, viz., six months' expenses	33,210 0 0		
On present value of the meters, the cost being £25,000	15,000 0 0		
Ditto on value of retorts	7,525 0 0		
Amount of tenants' capital	55,735 0 0		
5 per cent. is	2,786	0	0
Amount of tenants' profit being 12½. 5 per cent. on £55,735, the capital required	6,966	0	0
Amount of interests and tenants' profit for 12 months	9,752	0	0
The gross estimated rental, including rates, taxes, and repairs of buildings	12,212	12	0
Statutable deductions:— Rates and taxes are previously deducted herein.			
Insurance on buildings, amount £65,054, at 5s.	£162	0	0
The annual repairs of buildings are previously deducted.			
For renewal or reproducing 2 per cent. on the following, viz.:—			
Trade fixtures	39,672 0 0		
Utensils	12,945 0 0		
Mains on the stations	6,271 0 0		
Street main	105,760 0 0		
Total value	£164,648 0 0		
£164,648 at 2 per cent. is	3,292	0	0
Total renewal and insurance	3,454	0	0
Net rateable value of the whole property, the value being £278,998	8,758	12	0
Total value of all the stations	173,238	0	0
Total value of all the street mains laid	105,761	0	0
Total value of all the stations and street mains	278,999	0	0

Quantity of street mains:—

	Square Yards.
Square yards of street mains in St. Alphage, Greenwich	4,321
Square yards of street mains in all the other parishes	41,363
Total square yards of street mains in all the districts	45,684

To divide the rateable value of all the stations and mains:—

If £278,999 (the value of all the property) give £8758 as the net rateable value of the whole property, what will £173,238 (the value of the stations) give? Answer, £5438. Net ratable value of all the stations is	5,438	0	0
Ditto of all the mains is	3,320	0	0
Net ratable value of the whole	8,758	0	0
If £173,238 (the value of all the stations) give £5,438 as the net rateable value of all the stations, what will £41,953 (the value of the Greenwich stations) give? Answer, £1,316.			
If 45,684 square yards (the total quantity of street mains) give £3320 as the net rateable value of the whole of the mains, what will 4321 yards (the quantity of street mains in Greenwich) give? Answer, £314			
Net rateable value of the Greenwich station	£1,316	0	0
Net rateable value of the street mains in Greenwich	314	0	0
Total net rateable value of property in Greenwich	1,630	0	0

Cross-examined by *Mr. Russell*.—The total receipt for gas is from all the stations. I take the company's account to be correct, because it is an audited account. I consider the tradesmen's bills, £4614, a fair deduction for half a year. It is a large concern. I am informed that it includes all work done to keep the works, &c., in proper repair; for builders' repairs, &c. Not for new work, but for current repairs. I do not consider £9000 a year too much for such an extensive concern. The deduction for bad debts for half a year is from the actual accounts. I deducted coals and wages of men, £7430; and in the tradesmen's bills current repairs only are charged, not for depreciation. Implements and other things that would wear out would not come under the head of tradesmen's bills—not being current expenses—no more than a patch on your coat would; for, if there were a renewal, it would be a new coat. (A laugh.) I should be very sorry to attempt to carry on such a business with less capital than £33,210. I think any man must be mad to go into it under that. The two per cent. for renewal is from the decision of Lord Denman, towards the expense of the renewal of the works and mains; so that the property may always command the same rent. It is not included in depreciation. I cannot tell if it is put in the capital; there is nothing said that it must be done. There must be a capital of £15,000 for meters. Meters are out on premises belonging to other people, and are not fixtures. The retorts are tenants' fixtures; the meters are on the shelves and may be taken by anybody. The meters are attached to the service pipes, and the service pipes are attached to the main pipes. The supply pipes belong to the tenants. A tenant for these works ought to have a capital of £15,000 for meters, and £7525 more for other things, or else pay more rent; he ought to pay for them as for fixtures in a house. I don't think they could do without the meters at present. If a man took the premises without the meters it would cost him £25,000 to replace them. If fixed and partly used, as fixtures they would be worth £15,000. I have made no calculation what the works would be worth if the company let them with the retorts. You are asking a question not of fact but of opinion, and I have made no calculation on the subject.

What would a tenant give for the Greenwich works, retorts, meters, and mains?—I have made no calculation, nor could I do it now, as I don't even know the number of meters.

What would it let for if taken into the market?—I have given the gross value before: it would not let for more than £2024, which is the gross annual value; a responsible tenant would not give more; I do not include retorts; I cannot tell that, as I have made no calculations. I have refused to answer that question, as I have not separated them but taken them as a whole. A man could not carry on the manufacture to advantage in Greenwich alone. Under "Apparatus," I have included mains, purifiers, coolers, washers, and everything necessary for the manufacture of gas.

By *Mr. Deedes*.—If the works which I have calculated as a whole were let piecemeal, and taken into separate parishes, there must be a station for each parish, and, of course, twenty-three parishes must cause greater expense separate than if united.

By *Mr. Rose*.—If Greenwich were a separate parish it could not be carried on to advantage, and would not require such an expensive establishment.

Mr. William Tress, surveyor, examined by *Mr. Rose*.—I have had great experience in making valuations for the purpose of rating, chiefly for parishes. I have rated twelve of the largest parishes in and about London, also in other parishes; and almost all the gas and and water works in those parishes, for the companies and also for the parishes. I have seen the same accounts and figures as produced by Mr. Lee; I have personally visited all those stations with him, and have arrived at the same results as detailed by him. In my judgment that result is correct and just; in my judgment and from my experience I think it the proper mode to value. I have been regulated principally by the Cambridge and East London Water Works, which are the last cases before the public. With reference to those and other cases, I thought this was a fair mode to ascertain the value of the rateable property at Greenwich. I consider this mode is more favourable to parishes than to companies. In my judgment the deductions made in the account are fair and reasonable with regard to their respective heads. In order to carry out the subdivisions of parishes, the just mode is, first of all to ascertain the rateable value of the whole, then subdivide by making a rule-of-three sum of it. I agree with Mr. Lee's figures, and think the sum of £1630 the proper rateable value of the company's property in Greenwich parish. If each station were separate it would be worth much less than as a whole. I have ascertained the value entirely in order to get at the proportion of the rateable value.

Cross-examined by *Mr. Horn*.—I study all decisions on parochial assessments as they come out. Cambridge is not a favourite case. I read them all, and act up to them so far as my judgment will allow. I did not make my valuations on that case in particular, but upon others as well. All the cases do not agree, and some are very puzzling. They vary in some points as to the conclusions drawn from them. I consider that a tenant would pay a rent of £2024, deducting all rates and outgoings, for the works, with the privilege to supply the Greenwich district with gas. I doubt if, in the present state of gas companies, it would let for that. There is so much competition now among the companies, that it would be dangerous. If any one would give double that amount, I should say that he would soon be in Whitecross-street or Bedlam. (A laugh.) I think, if any parties gave more than I have stated, it would ruin them. By a rent of £2024 I mean a gross rent from year to year; from that make the deductions as allowed by act of Parliament, it would be £1630. It might reasonably be expected to let for that. For a tenant from year to year, the landlord to do the repairs, pay insurance, &c., £2024 might be reasonably expected, subject to the deductions referred to. £1630 would be a fair rental, and no more, if the tenant had to pay for the repairs, insurance, and other expenses.

By *Mr. Deedes*.—I have made this valuation as of one whole concern, which I think is the only correct way. If the parish of Greenwich were let alone, with the privilege of supplying it with gas, it could not be carried on profitably. The station and everything is out of proportion, and forms only part of one great whole.

This was the appellant's case.

Mr. Horn, for the respondents, said he had no doubt he should be able, by law and by facts, to show the real rateable value of the company's premises at Greenwich, and what responsible tenants would pay for them. That rent ought not to be collected from the costs of the erection, but as if taken into the market to ascertain

what a responsible tenant would pay. Before he entered upon the calculations which he would lay before the court, he would make one or two observations on the case. They had taken the whole premises at one valuation, and, after lumping them altogether, they had divided them into separate parts, although it appeared from their own evidence that Greenwich was more favourable than their other works in consequence of the gas ascending. Leaking and condensation on the whole works were averaged at 22½ per cent.; but when he inquired about Greenwich he was told it was only 15 per cent., which showed the superior advantage of Greenwich over the other stations, and also showed the fallacy of their calculation. This would considerably reduce the amount of the deductions which they claimed. With respect to the "tradesmen's bills," it was said they paid from 15s. to 15s. 4d. per ton for coal. He would call witnesses to prove that, if they paid that for coal, they did it in their own wrong, as at the gas works on the river Lee, where there was, of course, a greater expence of carriage, the price was only 14s. per ton. There ought, therefore, to be a large sum deducted from that account. He thought also that a considerable part of those bills ought to be put down as fixed capital, and not current expenses for the half-year, and he thought his lordship would cut it down. Then he thought the explanation about the meters was most extraordinary, as it made the company losers to the extent of £860 per annum by letting them. The explanation given was, that, as they had a large stock of meters which they could not sell, they let them out. Now, one would think, if they let them at such a loss, they had better reduce the stock as they become worn, and not keep them up by repairing them. Mr. Lee had stated that he had put down a large sum for these meters, treating them as floating capital, which was another fallacy, as they belonged to the fixed capital, and as such were rateable property, and ought to be treated as the buildings. He would call attention to one very great defect in the case, and which had been skilfully concealed. It had been stated that there was one description of pipe for Greenwich only, but his friends had not called attention to the fact that there were local pipes sending very little gas into Greenwich, but conveying it to Lewisham. Then there was a third class of pipes which served other parishes besides Greenwich and Lewisham, and consequently rateable to Greenwich. Mr. Horn then proceeded to comment on other parts of the appellants' case, particularly as to their mode of valuing, and also their value of the rental of the premises, for which he stated £5711 could be given for the privilege of supplying the Greenwich district with gas. He also cited cases to prove that the rateable value of property was what it would let for from year to year. The Great Western Railway had been more difficult than this to value, and yet persons had been found to value each station separately. He then called the following witnesses:—

Mr. Horn then called the following witnesses:—

Mr. Thomas Patten, examined by *Mr. Russell*.—I have carried on the business of gas engineer for thirty-six years, and have been employed by most of the gas companies in London. I was the first to introduce gas in London. I know the Phœnix Gas Company's works at Greenwich, Bankside, and Vauxhall. From the result of my experience I can say that Greenwich is a separate district from the others, and Greenwich district is supplied practically from Greenwich. I have no doubt if the others were done away with the result would be the same. For the purposes of that district Greenwich is separate. I examined some time since 130 retorts set there. 1¼ cwt. of coal would be the proper amount of coal required for each charge, four times in every 24 hours, that is 6 for each in 24 hours. The coals consumed in 130 retorts in one year would amount to 14,225 tons. 10,000 cubic feet of gas may be made from one ton of coal, that is, 142,250,000 cubic feet in one year, from which must be deducted 10 per cent. for leakage and waste. I have tested that for weeks together in London, Brighton, and Croydon, and always found it covered it, if the works were properly carried on. It is much about the same at Greenwich, where the works are very favourably situated, and the leakage not considerable. If there is a greater leakage at Greenwich I should think the mains are not properly laid, or the retorts not properly charged, which arises from want of proper attention. Deducting the leakage, it would leave 128,115,000 cubic feet. There are two proportions for sale at Greenwich, public and private. I allow one-sixth for the public lights, which, calculated at 3s. 10d. per 1000 feet, would be £4087. Private lights, 106,783,000 feet, at 6s. per 1000, would be £32,034, which, added together, makes £36,121, the gross receipts from the whole of the Greenwich district. The costs of manufacturing would be 14,235 tons of coal at 14s. I can buy the same quality at 12s. per ton as the company use; but I have made the calculation at 14s., from which there would be residuum deposits, 26 bus. coke 7s. 7d., 2 bus. breeze 3d., 10 gals. of tar 10d., ammonia 2d., amounting together to 8s. 10d. per ton, leaving 5s. 2d. per ton for coal. Taking the coal at 5s. 2d., it would amount to £3677; that would be the whole cost of the coal for a year. Besides coal, the cost of lime for purifying would be £236. The total cost of manufacturing, including salaries, wages, retorts, wear and tear, &c., would be £13,438. This, with further deductions for interest on capital employed for three months' average cost of manufacturing, 5 per cent. on tenants' property, bad debts, law, &c., making £4523, would make the total amount £17,961. Then allowing for dilapidations, renewals, &c., £2964, the whole deductions will amount to £20,925, which taken from £36,121, the amount of the rental, will leave £15,196 as the net rateable value of the whole of the Greenwich property. I have been through Lewisham and Greenwich, and had a list furnished to me by the company, from which I have calculated the tonnage of their mains for the different districts. I have measured the pipes and mains in the Greenwich district. Part of the main which goes from Greenwich station supplies Greenwich alone without going further; part goes through Greenwich and supplies Lewisham; other mains go from Greenwich and supply Camberwell and other parishes. I have measured the mains that supply Greenwich alone; also the tonnage of the main that supplies Lewisham from the Greenwich station. I have not the measurement with me, but the tonnage is about 86 tons as near as I can recollect. The whole of the tonnage in Greenwich is 86 tons, and 158 in Lewisham. I also measured the main which delivered gas from Greenwich to other parishes, of which there are 191 tons in Greenwich. The amount of main which runs into other parishes of the Greenwich district besides Lewisham is 2772 tonnage of mains. I have been through Greenwich parish, and found the rent from gas a little over £8000, and the Lewisham amount is £1196.

By *Mr. Deedes*.—I found the amounts by going from house to house, and saw the receipts of what was paid by the consumer.

By *Mr. Russell*.—I saw the burners in each house, and two-thirds of the parties showed me their receipts. A responsible tenant, I consider, would give for the station alone, with the prospect of lighting the rest of the district, £2000 a year, and to pay all rates and taxes. If a tenant had the station mains and profits of the company from year to year, it might reasonably let from £5700 to £5800 a year with the privileges of the present company.

Cross-examined by *Mr. Deedes*.—I have had considerable experience as an engineer. I have been concerned in most works in London, and as a manufacturer of machines and engines. I am a founder and engineer together. I have supplied the Phœnix with materials. Under the poor-law system I have been employed to value work, but not to carry out the principle of division. It is not the business of an engineer, and I have not done it. In giving £5700 as the total rateable value, I do not include the other parishes of the Greenwich district. That would be the rent if the parties had the liberty of lighting the whole district. I have not included the mains in the other parishes. I have not gone into calculations respecting them, and cannot tell. The company could not supply some of the mains if the Greenwich works did not exist. I do not believe that the other works at Bankside or Vauxhall could supply them. They are more readily supplied from Greenwich. If they were supplied from the other works the gas would be consumed before it got there; that was why these mains were laid down. One retort will carry more than 1½ cwt. of coal when new, but afterwards less. I saw one charged with that quantity which was at work eight or nine months. I have known some used sixteen months with care, but they average from twelve to fourteen months. I have given the tonnage as the best mode of ascertaining the value. The same result might be arrived at by yards; it would come pretty nearly the same. It is not the usual practice, and I have never heard of it before.

Re-examined: The company could not supply that district before the Greenwich mains were laid.

Mr. Charles Penfold, surveyor and engineer, examined by *Mr. Barrow*.—I have had extensive experience in surveying rail, gas, and water works in about 100 parishes. I have been employed by Greenwich parish. I have taken the basis for calculation from the figures given by the last witness. After arriving at the value of the whole, he proceeded to divide between the works and the mains in Greenwich district looking to the whole. The rateable value of the works at Greenwich is £2000. Deducting £2000 from £15,196, the remainder, £13,196, is the value of all the mains in the Greenwich district. The next process is to find the total receipts of the district, and where they were earned. Taking the receipts in Greenwich from the last witness as £8000, and deducting 63 per cent. for all expenses of manufacturing, &c., it would leave £2924 as the rateable value in Greenwich with respect to the receipts; Lewisham receipts, £1200, from which, making the same deductions, would leave £439. The rateable value of the tonnage from the works at Greenwich to Lewisham would be £154. There would be altogether £3711 due to Greenwich parish in respect to the mains. He then went into similar details as those of Mr. Patten, and considered £5711 was the rateable value of all the works in Greenwich parish. He considered that any tenant would give that sum under the Parochial Assessment Act.

Cross-examined by *Mr. Deedes*.—I have taken the same figures and adopted the same method as the last witness, and took £2000 for the station as the privilege to supply the whole district. I have adopted Mr. Patten's statement. Supposing the quantities and figures to be correct, £5711 would properly represent the rateable value of what the Greenwich works are worth to supply the other parishes.

Mr. Richard Strut Martyr, architect and surveyor, examined by *Mr. Horn*.—I am architect and surveyor to Greenwich, and St. Paul's, Deptford—also for the Deptford district. I have had much experience in surveying gas works among other works. I have valued the Greenwich works with Mr. Penfold and others. I agree with his statement, and consider that £5711 is a fair rateable value for the whole buildings and mains. I have gone through all the statements with him, and agree with him in every respect, supposing the figures supplied to be right.

Cross-examined by *Mr. Rose*.—I am most especially a valuer. The district surveyorship is another part of my business. I am specially retained for Greenwich and two parishes in Deptford, and also in other parishes from holding those appointments. The basis on which I have made my calculations is precisely the same as Mr. Penfold's, and from the same instructions.

Mr. Alfred Toy, engineer, Clerkenwell, examined by *Mr. Russell*.—I have had great experience in manufacturing gas, and am proprietor of the gas works at Bow. I have erected several gas works. I have examined the Phœnix works at Greenwich. I have examined the calculations made by Mr. Penfold. I concur pretty well with Mr. Patten as to the expenses of manufacturing gas, and all the deductions he has made. I think he has allowed sufficiently. I am paying 12s. per ton for coal at present. My works are on the river Lee. There are river dues and lighterage. The difference is only in the lighterage. There are no lock dues. If I put up meters I expect to get a profit by them; but I am aware that some companies do it from competition. They ought to be treated as part of the property. I

consider them as much property as the mains. I cannot say if Greenwich can be practically considered to supply gas alone for Greenwich, as I have not gone over the works. I think a fair average for leakage is 10 per cent. My own works are subject to a severe test, as the pipes pass between two lines of rails, and there is a continual shaking. But I find 10 per cent. a fair average.

Cross-examined by *Mr. Rose.*—I have been manufacturing gas seven years in London and the neighbourhood. I first carried it on in Leicester-square, but I didn't supply anything there. They were my business premises, but I did not make gas there. It is only three years since I was a manufacturer of gas, and not seven years. I have been a brass fitter and founder for seven years. I used to put up the apparatus, but not make gas. The first time that I manufactured gas was three years ago, when I superintended the erection of gas works at the Norwich, Brandon, and Tottenham railway stations; they are all small works to supply the railway stations. At the Norwich station, I think, we manufactured 5000 or 6000 feet a day. The length of pipes was not great, nor had I an opportunity to know much about the leakage. I didn't live there; my manager lived there, and he used to report to me weekly of the quantity made and the prices. I did not superintend it personally. I never superintended it personally. I knew 10 per cent. to be the leakage, from the quantity of coal used in six months, and the quantity of gas I received the rent for, taking the average of 10,000 feet from one ton of coal. I took it from the actual measurement of the meters. There is one at Shoreditch close to the gas lights. The gas passes through the main to the meter, and branches off in several pipes. The meter is close to the gas lights. I suppose the first meter is about a mile and a half from the works; then, perhaps, there are a thousand lights before you come to the other. After the first meter, I cannot tell what the leakage is between the two. Coals are cheap just now. I get mine from a coal company near Shields. They deliver them at the works for 12s. The works are close to the river, and there is no cartage required. The contractor lands them on the wharf.

By *Mr. Russell.*—I should say 14s. a ton is a high price for coal.

Mr. Charles Pridden, secretary to the Phœnix Gas Company, examined by *Mr. Horn.*—We buy our coals direct from the collieries, and the cost is as stated in the accounts.

Mr. Barrow, for the respondents, thought that the first error that had been committed was that of the company taking the whole works as one concern. He considered that, were there several stations sending gas, there would be some place where the pressure would be equal. It was stated by one witness that the leakage at Greenwich was 15 per cent., although more favourably situated than the Vauxhall and Bankside stations. If, as a matter of fact, all the gas was supplied under the same advantages, then their line of argument would be right. But they were wrong on another principle: they had taken the rateable value of the whole works, and had not, according to the evidence, rated the property at so much as it ought to be rated. He then called the attention of the court to the gross sum received for the gas supplied, comparing it with the total outgoings of the company; and contended that, in fact, they were underrated. The whole receipts in Greenwich were said to be £8000, and £3711 was the rateable value of the mains in that parish. He submitted, therefore, to the court that the rate must be confirmed. If the company chose to lose in the manner of conducting their business, it was no index of what it would be if a tenant conducted the works in a proper manner.

Mr. Deedes, in replying upon the case, would ask upon what grounds or upon what evidence had the Phœnix Company been convicted of carelessness or mismanagement in the method of conducting their business? It was absurd to say they had. He thought their figures would be the data on which the court would decide. They had produced their accounts, and shown their deductions. The figures of both were before the court, who were well able to deal with them, and, therefore, he would not dwell further on that subject. It had been said they had gone on the cost of the works. Now, it was no such thing. He did not mean by the saleable value the original costs of the construction, but from their present actual value. It had also been said they had erred in considering the Phœnix Company as one great concern, which was unfair to Greenwich. But why should they divide the twenty-three parishes—one great concern—to give an advantage to Greenwich? He never knew an instance of one part of a railway taken from another. But they were all taken as one concern, as in the Great Western case, where the court had decided that it should be taken with reference to branches and all the works, and decide according to the total; and, although the property was easily divisible on that line, yet it had not been done. In Mile-end Town there were twenty-one parishes, all brought out as one total and one concern. No doubt that Greenwich had always been treated as one concern; and it was impossible to say what particular pipes or mains are supplied from Vauxhall or what from Bankside. His friend had said the company were in a condition to lay before the court the real figures. They had done so. But what had his friends done? They had not produced real figures, but proceeded on conjectural statements. Looking at their paper as laid before the court, they assume the works at Greenwich to produce a rental of £36,000 odd, making a total rateable value of £15,196, from which they obtain £5711 as the proper sum here. Now, the facts proved that the gas sold for only £18,000.

Mr. Deedes proceeded to notice further discrepancies in the statements of the respondents, and said:—Mr. Horn had said there had been a defect in the appellant's case, which had been carefully concealed; but he (Mr. Horn) was in error, for Mr. Lee had expressly stated that all those pipes were included in his estimate. Lord Denman had decided that the whole profits and the whole deductions were to be taken, and he (Mr. Deedes) would maintain that it was one property, and the whole ought to be treated as one concern. Taking the real amounts, the total rateable property would be £1630, instead of £5711, which sum the parish is asking to confirm as a proper and just rate.

The court retired to consider their judgment, and remained absent nearly two hours. On their return,

The noble CHAIRMAN said that the court had decided to look upon the property as a whole, and to amend the rate on the basis of the total rateable value, being £13,600, which amount must be divided in the proportion and on the basis stated in the case for the appellants. The rate must, therefore, be reduced to £2045 on the works, and £487 on the mains in Greenwich parish.

The solicitors for the appellants were Messrs. Young, Vallings, and Young; and for the respondents Mr. James, vestry-clerk.

Review.

Gas Lighting: its Progress and its Prospects. With Remarks on the Rating of Gas Mains, and a Note on the Electric Light. By J. O. N. Rutter, F.R.A.S. Parker, West Strand. 1849.

The author is already advantageously known by several clever little treatises on the subject, which have had an extensive circulation amongst all persons who take an interest in the advancement of gas lighting. His new publication will add considerably to his reputation with the general public, though we are rather disappointed at the small amount of practical information contained in it, and had hoped that he would have himself set the example, and given us the benefit of his opinion, upon some of the litigated points which now agitate the gas world. He remarks—"My sole purpose has been to exhibit that which I know and believe to be true;" and so impartially has he done this, that he leaves us in some doubt as to what his real opinions are upon many of the subjects to which he refers. We shall, therefore, leave him to speak for himself upon many of them, and content ourselves with a few brief remarks as we proceed.

His views as to the impolicy of adhering to the exploded system of supplying the public lamps at unremunerating prices exactly coincide with those we have promulgated, and are thus happily expressed:—

"Let the manufacture and sale of gas be subjected to the same rules, and conducted on the same principles, that prevail in other commercial transactions, and there would be no further difficulty. Let the causes of the present disputes about high prices to one class, and low prices to another, be removed, and the effects would cease. Divested of its present mysteries, the sale of gas would be as easily managed, and as well understood, as the sale of candles. Deprive gas companies of the excuse they have so long, and so successfully, pleaded for unequal prices, and there would soon be a satisfactory adjustment. Let reasonable and, indeed, liberal allowances be made to large customers, as in other wholesale transactions. Of this, no one could justly complain. Freedom of competition, and the force of public opinion, would be sufficiently powerful to keep down monopoly. The proprietors of gas works would be found to act like most other men, who really understand their business—namely, that in serving well their customers, they best served themselves. The use of gas would become general, its manufacturers would be fairly remunerated, and the public would no longer have any just cause for being dissatisfied.

"If it be said, as it often has been, that parochial authorities cannot afford to pay a greater price for gas than they have hitherto done, might it not be replied that they are not justified in buying what they cannot afford to pay for, any more than they are in taxing, on that plea, one class of parishioners at a higher rate than another? What would be said of a board of guardians who required the poor to be supplied with meat, bread, and other necessaries, at one-fourth the usual charges for such articles; assigning as a reason, that they could not afford to pay higher prices, and, if demanded, the poor must starve?

"Local as well as general taxation presses heavily. Its pressure would, however, be less felt, and less the subject of complaint, if more equitably divided. In the matter under consideration a great deal more might be done, with the same amount of expenditure, if it were better managed. The whole system of street-lighting requires revision. Many improvements may be made; but nothing will be attempted while gas is supplied on the present conditions. If the cost of efficiently lighting streets, by more judicious arrangements, were to be a little greater than at present, the difference would amount to a mere trifle in individual expenditure, if fairly distributed. Moreover, be it remembered, that there are but few parishes in which economy, in matters of less importance, would not yield more than sufficient to pay all that would be required in addition to the present charges for gas.

Thus much for an account of one of the early errors in the science of gas lighting. It has so interwoven itself with the sale of gas, following it in its progress from town to town, that something more than ordinary efforts are now required to make the matter understood; and until that be done there will be no alteration. Whatever may be the exertions of public authorities in obtaining 'cheap gas,' they begin and end in serving themselves. Cheap gas to them means dear gas to the great body of private consumers. There is often a great show of patriotism, but it wants the charm of disinterestedness. Let 'pressure from without' be rightly applied to local commissioners and parish boards, and gas consumers will soon understand the whole question. Raise the price of gas to parishes, and then consumers will have both reason and justice on their side for its being lowered to themselves. Let consumers help the gas companies in breaking up the real monopoly, and the gas companies will be ready

enough to help them to a participation in the benefits. It must come to this. The sooner the better."

We cordially recommend the following to the consideration of the class to whom it is addressed:—

"There is no class of capitalists more liable to have their fears wrought upon than gas proprietors. This is chiefly to be attributed to the small amount of information which they possess, as to the nature, and the extent, of the business in which their property is embarked. It is not to be expected, neither is it necessary, that they should understand the details of the manufacturing and distributing processes. Such matters are better left to the care and management of those to whom they properly belong. Gas proprietors should cultivate a good understanding among themselves. They should possess authentic intelligence about inventions or occurrences which are likely to affect their interests. They should know more than appears to be generally known by them about the number of gas establishments, the magnitude of their operations, the amount of capital invested in them, and the rates of interest paid thereon. This kind of information would naturally lead to inquiries as to the prices of gas in various parts of the kingdom, the reasons for its being greater in some localities than in others, and in small towns than in large ones. The possessors of this kind of knowledge would have more correct views of the value of their respective properties, they would have clearer perceptions of the position and prospects of gas lighting, and, by looking further ahead, would be the better prepared for approaching changes. They would learn that gas lighting is rapidly extending, not only by its entering upon new fields of enterprise, but by greater skill and diligence being applied in cultivating the ground already occupied. If there be less necessity for new works, it is gratifying to know that, in almost every populous town and district, the old ones are undergoing frequent alterations and enlargements; the quantity of gas now required being three times, and in some places four times, as great as it was seven years since. These are the materials which constitute the statistics of gas lighting, and which at present are little more than rough guesses. If there were less reserve and jealousy in communicating information, there would be less difficulty in collecting and arranging it. Selfishness and exclusiveness have been tried. They have done no good. Is it not desirable that we adopt a more liberal system,—one whose chief element is truth, and whose sole object is good will?

"Nor is the information just referred to all that is necessary. The proprietors of gas works ought to know, and therefore be able to judge, somewhat of the merits of new inventions which are occasionally brought forward, and of which it is confidently stated that they are likely to interfere with the progress of gas lighting. Very recently, how much unnecessary alarm was created by a few cleverly-written newspaper paragraphs about the electric light! Nothing could more clearly demonstrate the sensitiveness of gas proprietors than their conduct on that occasion. In the largest and most prosperous companies, both in the metropolis and the provinces, shares fell 25 to 30 per cent. in a few days; whilst contracts were deferred, and works actually in progress were hastily suspended.

"To dispel or, what is still better, to prevent needless fear, there is nothing so effective as accurate information. It must, however, be used judiciously, or it will lead astray. If all that was said about the electric light had been true, would that have been sufficient to justify the sale of gas shares at two-thirds their previous value? Could the use of gas have been so instantly superseded that no breathing time would have been allowed for gas proprietors to look about them? Great improvements have not hitherto come upon us quite so suddenly. Newspaper paragraphs, attractive advertisements, and provisionally-registered companies, are fabricated more quickly, and at a cheaper rate, than electric batteries. Whatever partakes of the marvellous, and is least like truth, is the most readily believed. The number of those who permit themselves to be imposed upon is a thousand times greater than of those who ignorantly promulgate error, or knowingly practise deception. In such matters, patience and prudence are the best defence. Do nothing hastily. That which is done in a hurry is seldom done well."

Many parties will doubt the accuracy of some of the assertions contained in the following quotation; and we incline to the opinion that they must be accepted with some reservation:—

"Most of the large provincial towns have passed, or are now passing, through the ordeal of low prices. Whatever at first may be the difficulties, there needs only courage, and patience, and perseverance, and all will come right. There may be fears; but there ought also to be a bold margin allowed for confidence. The efforts of those who led the way in reducing prices have been abundantly rewarded. Whilst some companies have been looking on, struggling and deliberating, doing nothing, and not knowing what to do, the business of others has increased so rapidly as to have outgrown all their expectations. In every instance where the experiment has been fairly tried, it has been successful. Making suitable allowances for timidity, especially where men have the responsibility of acting for others, as well as for themselves, there is no longer any cause for hesitation. If there be need for reducing prices, and the business of the company, present and prospective, will bear it, whether in large towns or in small ones, it should not be deferred. Waiting for better times, at high prices, is so much time wasted. Instead of reducing by little and little, go at once to what may be considered a safe minimum charge; and which can be determined only by special conditions in every case. It may be necessary to pinch a little for a year or two. Better to do that than go on pinching in perpetuity. There is an elasticity about gas lighting understood only by those who have experienced its effects. Relieve it from the pressure of patronage and privileges, from protection and, its constant attendant, high prices, and it will soon exult in its freedom from such unnatural restraints. Let there be the fullest inquiry, and the most mature deliberation, before a reduction of price be settled; and then, when the mind is made up, act firmly and promptly, undismayed by threats on the one hand, and unmoved by promises or persuasions on the other.

"Reasonable prices, a large business, and a small rate of profit, are the elements of prosperity. Less dependent on persons, and less affected by circumstances, than under the old system, gas companies no longer are in constant dread of opposition; and where competition exists, its venom is extracted. People are slow in acknowledging that which it is not agreeable to them to believe. There is no fact more patent than that competition in gas lighting has failed in accomplishing all that was predicated of it. Partial in its application, and uncertain as respects duration, its practical effects have been more injurious to consumers than they have been beneficial. Guided by right principles, and subjected to wholesome restraints, gas making can always be conducted better and cheaper by one company than by two. Those reckon in total ignorance of the motives and impulses which operate upon commercial men, who suppose that they risk their property, and give up their time, for the sole purpose of pleasing one portion, and of displeasing another portion, of their neighbours. Gain is the stimulus to exertion, and the allurement to enterprise. Hence it is that unprofitable competition in gas lighting soon exhausts itself. Mutual forbearance brings about mutual compromise, which is soon succeeded by agreements, and, as we have lately seen, a still more friendly understanding, which ends in amalgamation. And who can object to this, so long as the public are well supplied with good gas, at a fair price? If these conditions be not complied with, the remedy, as theretofore, is in their own hands.

"If there be good gas at a fair price, the public have nothing to do with the cost of the works, the amount of capital, or the dividend paid thereon. One man will live where another would starve. Activity, economy, and intelligence, always have been, and always will be, an over-match for indolence, waste, and stupidity. These distinctions are appreciated in the ordinary affairs of life. What is to prevent the application of the same principles to trading companies?"

Mr. Rutter is peculiarly at home when he treats of the use of gas in private houses. It is a subject which has, to our knowledge, attracted his attention for many years, and has afforded a field for the exercise of his inventive genius. In Scotland and the North of England the public have been long acquainted with its advantages; and we are glad to see such rapid progress is now making in other districts. He remarks:—

"Let me mention, as first in importance, the use of gas in private houses. In all large, and in many small, towns, the shop-windows bear their testimony to the estimation in which gas light is held. An old-established business, carried on by old-fashioned folk, needs none of these attractions; but where a business has to be made, or competition runs high, gas light is a most important accessory. Look at shops, arranged side by side, or a few doors apart, whether drapers', or tea-dealers', or jewellers', and who can tell whether the competition be greatest in plate-glass, in the goods exposed for sale, or in gas-light? Whatever be the allurements to customers by day, it is certain that the chief dependence at night is upon the fascination of a brilliant light. Only let a man of superior taste in such matters make a successful hit by the number, or method of arranging, of his gas burners, the style of the fittings, or the shape of the glasses, and such things are immediately copied, even to the pattern of the paper upon the walls of his shop, and the size, and colour, and shape of the letters over the door. These things are of every-day occurrence. They cause constant changes, and so many attempts at improvement, that it might be supposed the parties were rivalling each other in the sale of light, instead of more ponderable materials. Kept within reasonable limits, there is nothing objectionable in all this. If the public must have a good light, let them be gratified. Here, it must be acknowledged, is one of the results of cheap gas; for it is cheap as compared with former times, and, in many places, as cheap as it is likely to be for some years to come.

With all this commendable anxiety about having a good light in shops, and business premises generally, is it not surprising that private rooms have been so slow in participating in the same benefits? Gas companies are here chiefly in fault. They have not been half awake to their true interests, nor have they half performed their duties to the public. In thousands of instances men, who pride themselves on excelling their neighbours in the style in which they light their shops, when they join their families at night are constantly making the discovery that candles are not so good, and oil not so pure, as they used to be, since neither of them yield sufficient light to eat, or read, or even talk, by in comfort! And why is this? Because such persons have never been solicited to burn gas in their dwelling-houses. The subject has never been properly brought under their notice, and so things have gone on in the old track; and, if nothing be said to the contrary, there they will continue. If so little has been done with persons who have all their lifetime been accustomed to gas, if their houses remain unlighted, it is no wonder that even less has been done, or perhaps nothing attempted, with other classes of houses, and which are not connected with business. A movement in the right direction has been commenced. It needs all the aids, and energies, and other appliances of persuasion and explanation, to help it forward. The advantages of gas light in private houses are beginning to be understood. It is still only a small beginning, and, in numerous instances, it has not even come to that. In a few large towns, something in this way, deserving both of notice and of imitation, has, for some time, been in progress; but not a tenth part of what might be done, or of what must be done, has yet been accomplished. Gas companies must extend their operations. Low prices, and a small rate of profit, require large returns to pay satisfactory dividends. Here is a field so extensive, that all may labour in it, and in which the ground is so well prepared, that the results will be immediate, and in exact proportion to the energies put forth. The difficulties are but trifling, and many of them imaginary.

By devoting constant and special attention to the lighting of private houses, a new business might be created. It will differ, in many respects, from old-established usages; and in none more than the greater number of burners required to produce an equal amount of revenue; but it will soon be found to possess the essentials of a good business—permanency and profit."

We have elsewhere promulgated some views as to the rating of gas works rather opposed to some of those entertained by Mr. Rutter. A fixed uniform rate upon main pipes, according to their dimensions, could never be accepted by the Legislature, which has required that it shall be fixed according to the rent a tenant will pay; and in ascertaining this there are other considerations besides the dimensions and length of the mains. Let Mr. Rutter again speak for himself:—

"A gas work, like a railway, must be viewed as one entire and indivisible machine; the mains in one case being analogous to the rails in the other. Where it happens that a gas work, as well as the mains, is situate in one parish—as from that circumstance a more kindly feeling, as well as a common interest, is likely to exist—the rating, in such a case, is usually a very simple affair. Not so, however, where the works are in one parish, and the mains in another, or perhaps in several others. Here arise the difficulties, and hence originate almost interminable disagreements, and feelings of dissatisfaction. The settlement of a rate in one parish is frequently the signal for making some alteration in another; and so the chord is kept in constant vibration, and it is always discordant. Assessors differ in their views: arriving at conclusions as opposite and as contradictory as can be well imagined; referring all the time to the Parochial Assessment Act as their text-book, and to the decisions of Lord Denman as their authority.

"In rating gas mains nothing is more common than to treat them as if they were distinct from the works. This is wrong; and hence have arisen many of the disputes upon this troublesome subject. The works being in one parish, and the mains in another, there is a contest as to which is the most productive part of the plant. It is, of course, the interest of both parties to get as much as possible. Mains are necessarily an integral part, or rather an extension of, the works; and one part would be useless to the proprietors without the other. Mains to a gas company are similar in their uses to horses and drays to a brewer, that is, they convey goods to the customers. But a brewer is not rated for stables and sheds in the various parishes in which his customers reside; although, be it remembered, the horses and drays cause actual wear and tear of the roads over which they pass, and yet contribute nothing to the repairs. It is useless to press an analogy beyond what is reasonable. The reference just made applies chiefly to towns. In rural parishes tolls come to the aid of the road-trusts; and there the brewer has to pay his proportion. This, however, is in the nature of private compensation, and is not a parochial rate.

"In the matter under consideration I think a principle of rating gas-mains might be established that would be equitable, uniform, and satisfactory. First of all, let the relation subsisting between the works and the mains be settled. Whatever be the locality or the extent of the works, it is certain that the manufacturing parts, and the distributing parts, must be proportioned the one to the other. If it be considered that the space occupied by the works, and the the buildings and apparatus of which they consist, are sufficient in all cases, independently of the mains, to determine their rateable value, I know of no objection to that plan, provided it be fairly carried out. What remains to be done might then be greatly simplified by a fixed charge per yard, or per 100 yards, upon the mains, and varying in amount according to their sizes. By a graduated charge there would no longer be any cause for disputes about first cost or present value. Such a charge might be so levied as to be a remarkably accurate representative of the capabilities of mains of various sizes, and of the duties they perform in earning revenue. In the metropolis, and in some large provincial towns, a correction, for the greater productiveness of mains, will be necessary. This would present no practical difficulty to the general application of this principle of rating. On the contrary, it would render it more efficient, by the greater simplicity it would impart to the system; a graduated scale of revenue per mile being made the basis for the charge per yard, or per 100 yards, as before mentioned. An increase of business, requiring an extension of mains, would be accompanied by an additional amount of local taxation. The additions thus made would however, be exactly in proportion to the occupancy, and the amount would be known beforehand. Now, such additions are made at uncertain intervals, and by a hap-hazard species of calculation.

"If it be objected that a constant charge upon mains, according to sizes and quantity, would operate unfavourably against the companies, inasmuch that revenue is not a true index of profit, I reply that there are two parties to the bargain, and the question must be looked at on both sides. The object is to destroy, not to perpetuate, the old elements of discord. Let there be a fair balancing of interests, or there will be no permanent agreement."

The above extracts are fair specimens of the whole work, which is generally characterized by much shrewdness, interspersed with a pleasant quaintness of style which cannot fail to be attractive to the general reader.

Register of New Patents.

William Wilkinson, Durham, coke manufacturer, for "*certain improvements in the construction of coke ovens, and in machinery or apparatus to be connected therewith.*" Patent dated Nov. 16, 1848.

1. The coke ovens are built with flues in the walls, which are furnished with lateral holes, whereby the air is supplied to the interior (instead of through the door as hitherto), and is equally distributed over the burning mass.

2. In front of the series of ovens is a rotary shaft, on which are placed pinions, that may be moved to the right or to the left, and consequently made to gear in or out of racks cut in the ends of rods, which are thus caused to slide horizontally just above the floors of the ovens. The inside ends of the rods carry oblong iron plates, which, as they travel forwards, force the coke out of the oven.

3. The patentee proposes to economise the heat resulting from the charring of the coal, and to apply it to the evaporation of saline solutions by causing the flues from the ovens to pass underneath an evaporating pan. The temperature of the flues is regulated by means of two furnaces at each end, which serve also to consume the gaseous products. A crystallizing pan is put in communication with the evaporating pan, and is fitted with furnaces to precipitate the salt.

Claims.—1. Forming the walls of coke ovens with flues having lateral openings for the purpose of supplying air to the interior, and diffusing it equally over the burning mass.

2. The mechanical means, or any analogous arrangement, for discharging the coke.

3. The mode of economising the heat produced from the coke, and applying it to the evaporation of saline solutions.

John Oliver York, 24, Rue de la Madelaine, Paris, engineer, for "*improvements in the manufacture of metallic tubes.*" Patent dated Nov. 21, 1848.

Mr. York proposes to cast iron or steel tubes in thick short lengths, which are afterwards to be rolled out to the requisite thickness by being placed upon a mandril of rather less diameter than the bore of the intended tubes, and passed, while in a heated state, between a pair of rollers, furnished with a number of grooves on their peripheries, which are of gradually decreasing diameter; or the short tubes may be slid on to a fixed mandril, which is supported in the grooves of a series of pairs of rollers, and made at those parts which are in the grooves thicker than elsewhere, but not quite equal to the diameter of the bore of the intended tube. The diameter of the grooves of each pair of rollers decreases gradually, till the last, which is equal to that of the exterior circumference of the tube. The thick tube is slid up to the first pair of rollers, which seizes hold of it, partly compresses it, and passes it on to the next pair, which does the same; and so on throughout the series. At each succeeding operation the tube is shifted one-fourth round, in order that the roller may act upon different portions of the tube successively. The thick short iron tubes may be formed of bars with bevelled edges, bent round a rod, and welded together when on the mandril by the action of the first pair of rollers.

The patentee proposes, lastly, to change the form of the flues in tubular boilers from a circular into an oblong or rectangular one, by drawing them, while hot, through a die-plate, which shall have the effect of pressing the sides together, and, consequently, of decreasing their area without decreasing their heating surface.

Claims.—1. The mode or modes of manufacturing iron and steel tubes by rolling or pressing thick short cylinders of these metals upon a straight mandril between a pair of grooved rollers.

2. The mode or modes of manufacturing iron or steel tubes by rolling or pressing thick short cylinders of these metals over and upon a stationary mandril, between a series of pairs of grooved rollers.

3. The mode of decreasing the area without decreasing the surface of flues in tubular furnaces.

William Knapton, York, ironfounder, for "*certain improvements in the mode of manufacturing gasometers or gasholders.*" Patent dated Jan. 3, 1849.

The object of these improvements in gasometers is to supersede the use of water-tanks. The top and bottom of each gasometer is made of angle iron, to which iron plates are riveted; and the side is composed partly of iron and partly of some flexible material, rendered impermeable to gas, so that as the gas escapes the area of the holder may be decreased. The bottom of the gasometer is supported upon cast-iron columns, and the top is suspended from weighed chains as usual.

Claim.—The manufacturing of gasholders or gasometers of flexible and inflexible materials.

William Gilmour Wilson, Port Dundas, Glasgow, engineer, for "*improvements in the formation of moulds and cores of moulds for casting iron and other substances.*" Patent dated Dec. 30, 1848.

Claims.—1. A mode of constructing and working metal patterns.

2. The mode of manufacturing moulds by cutting them at parts to get at the internal patterns.

3. A mode of constructing moulds for cylinders and other castings, when the pattern is of a conical or taper form preceding a form with parallel sides, by forcing it through the sand; also a method of forcing or moving the patterns by hydraulic pressure.

4. Making the patterns of flexible materials.

5. Making the core-bars with joints or hinges, so that, when drawn inwards towards the centre of the core-bars, they may collapse.

6. Making the core-bars in such a manner that, on the withdrawal of wedges from the internal and external parts, they shall collapse.

7. Making the cores with a spiral twist, and making the cores by remaining vertically between core-boxes and core-bars.

Gas Fittings.—Tenders for Messrs. Welch and Margetson's new warehouse, Cheapside. Quantities supplied by Mr. O. Tillott.

Edge	£133	12	3
Meacock	114	8	4
Bownes	105	19	1
Strode	95	16	0
Debaufer	90	15	9
Cowan	90	5	7
T. Ledger (accepted)	69	18	0

Share List.

THE PRICES QUOTED ARE THOSE AT WHICH THE LAST SALES HAVE BEEN MADE.

The Companies whose names are printed in italic type are incorporated by Act of Parliament.

Number of Shares issued.	Amount per Share £	Name of Company.	Amount paid up per Share £ s. d	Dividend per Cent. per Ann. £ s. d	Price. £ s. d
		ENGLAND.			
		Abergavenny			
		Aberystwith			
		Abingdon			
		Accrington £5500		5 0 0	
		Alcester			
		Alford, Lincolnsh.			
		Alfreton			
		Alnwick			
		Alston Moor			
		Alton			
800	5	Altrincham	5 0 0		
		Amlwch			
		Ampthill			
350	10	Andover	10 0 0	5 0 0	10 0 0
		Appleby			
		Arundel			
		Ashbourn, Derby			
		Ashburton			
		Ashby-de-la-Zouch			
		Ashford, Kent			
		Ashton-under-Line £42,500		13 4 0	
		Atherstone			
		Axminster			
225	20	Aylesbury	20 0 0	5 0 0	20 0 0
		Aylsham, Norfolk			
		Bacup, Yorkshire			
		Bakewell			
		Baldock			
		Banbury			
		Bangor			
500	5	Barking, Essex	4 10 0	5 11 0	5 0 0
250	10	Barnard Castle	10 0 0	5 10 0	10 15 0
		Barnet			
		Barnsley £6000		7 10 0	
100	20	Barnstaple	20 0 0	7 10 0	25 0 0
120	25	Basingstoke	25 0 0	8 0 0	28 0 0
2400	20	*Bath*	16 0 0	10 0 0	21 to 23
		Battle £2000		6 0 0	
56	26½	Bawtry	36 10 0	5 0 0	25 0 0
		Beccles, Bungay, and Lowestoft			
		Bedford			
		Bedale, Yorkshire			
		Belper			
		Beminster			
700	5½	Berwick-on-Tweed	5 10 0	6 8 0	5 15 0
		Beverley			
		Bewdley			
280	10	Bideford	10 0 0	6 0 0	10 10 0
		Biggleswade			
		Bicester			
		Bilston £25,000			
		Billericay			
		Bingley			
		Birkenhead and Claughton £56553	35 0 0	3 7 6	32 to 34
2400	50	*Birmingham and Staffordshire*	50 0 0	8 0 0	64 to 66
	25	*Ditto*, new shares	7 10 0	8 0 0	10½ to 11½
704	75	Birmingham	75 0 0	6 13 4	108 to 110
		Bishop's Auckland			
		Bishop's Stortford			
		Blackburn £24,000		8 0 0	
		Blandford			
		Blythe			
		Bodmin			
		Bolton £49,500		9 0 0	
		Boroughbridge			
		Boston £8000		6 0 0	
200	10	Bourn	10 0 0	5 0 0	
		Bradford, Wilts			
		Bradford, Yorksh. £45,000		10 0 0	
		Brampton, Cumb.			
		Brandon, Suffolk			
		Brecon			
		Bridge-end, Glam.			
		Brierly Hill			
2250	20	*Brighton*	20 0 0	5 0 0	16 to 16 10
1125	20	,, new shares	16 0 0	5 0 0	
		Brighton and Hove £50,376			
4250	20	*Bristol*	20 0 0	10 0 0	37 to 39
1630	25	*Bristol and Clifton*	25 0 0	6 0 0	25 0 0
		Brixham			
		Braintree			
750	50	*Brentford*	50 0 0	6 0 0	47 to 48
800	25	,, new shares	11 0 0	6 0 0	11 0 0
		Brentwood			
		Bridgnorth			
		Bridgwater £6000		5 0 0	
400	10	Bridlington	10 0 0		8 0 0
		Bridport			
		Brigg			
		Broadstairs			
100	50	Bromley, Kent	50 0 0	6 0 0	52 10 0
		Bromsgrove			
120	10	Bruton	10 0 0	4 0 0	8 0 0
100	25	Buckingham	25 0 0	5 0 0	25 0 0
		Bungay (see Beccles)			
		Burford			
		Burlington			
		Burnley £19,946			
		Burslem			
		Burton-on-Trent			
		Bury St. Edmund's			
		Bury, Lancashire £6570			
		Buxton			
		Calne, Wilts			
		Camborne			
		Cambridge £32,000		7 0 0	
240	50	*Canterbury* Gas and Water	50 0 0	6 0 0	57 to 58
240	25	*Ditto*, second issue	25 0 0	6 0 0	25 0 0
		Cardiff £10,500		7 10 0	
		Carlisle £9000		8 0 0	
		Carmarthen			
		arnarvon			
		Castle Cary			
		Chapel on the Frith			
		Chard			
		Chatham (see Rochester)			
		Chatteris			
		Cheadle			
		Chelmsford			
		Cheltenham £17,242 10s.		8 10 0	
		Chepstow			
		Chertsey			
		Chesham, Bucks			
		Chester			
		Chesterfield £12,023 14s. 1d.			
240	25	Chichester	25 0 0	6 0 0	30 0 0
		Chippenham			
		Chipping Norton			
		Chorley			
		Cirencester			
		Clare			
		Clifton (Bristol and Clifton)			
		Cleckheaton, York.			
		Clitheroe			
		Cockermouth			
		Colchester			
		Colne, Lancashire			
		Coleford, Gloster			
		Coggeshall			
		Congleton £5000		7 10 0	
		Conway			
		Cowbridge			
800	25	*Coventry*	25 0 0	5 0 0	20 0 0
		Cowes			
		Crewkerne			
		Croydon			
		Cranbrook £1900		5 0 0	
		Crediton			
		Crewe, Cheshire			
		Darlaston			
		Darlington			
250	20	Dartford	20 0 0	7 10 0	27 0 0
		Dartmouth			
125	20	Daventry	20 0 0	6 0 0	24 8 0
500	6	Denbigh	6 0 0	5 0 0	6 0 0
820	10	Deptford, Bermondsey, and Rotherhithe	10 0 0	5 0 0	4 10 0
		Derby £16,250		7 10 0	
90	20	Dereham (East)	20 0 0	4 10 0	
1000	5	*Dewsbury*	5 0 0	7 10 0	8 12 6
		Devizes			
4000	5	*Devonport*	5 0 0	6 0 0	5 14 0
		Diss			
		Doncaster			
280	25	Dorchester	25 0 0	5 0 0	25 0 0
120	25	Dorking	20 10 0	5 0 0	21 10 0
		Douglas, Isle of M.			
209	56¼	*Dover*	56 10 0	6 0 0	56 10 0
		Downham			
		Driffield			
		Droitwich			
600	20	*Dudley*	20 0 0	4 0 0	16 to 18
		Dunmow			
		Dunstable			
		Durham			
276	9	Dursley, Gloster	9 0 0	5 10 0	8 0 0
		Elland			
		Ellesmere			
300	19	Epsom	19 0 0		
		Evesham			
		Exeter £40,000		8 0 0	
		Exmouth			
		Eye, Suffolk			
		Fakenham			
		Falmouth			
		Fareham			
120	25	Farnham	25 0 0	10 0 0	42 0 0
		Farringdon			
		Faversham			
		Fleetwood			
		Folkestone			
		Frome			
		Gillingham, Dorset			
		Glastonbury			
		Glossop £6000		7 0 0	
		Gloucester £24,600		7 10 0	
		Godalming			
		Gosport			
		Grantham			
		Gravesend			
1000	10	*Great Grimsby*	6 10 0	8 0 0	8 5 0
		Guildford			
		Guisborough			
		Hadleigh			
		Hales Owen			
300	6	Halesworth	6 0 0	7 10 0	5 10 0
		Halifax £15,000		8 0 0	
		Halstead			
		Harleston			
		Harrogate £10,000			
		Hartlepool £7835		7 0 0	
		Haslingden, Lancsh.			
330	50	Hastings and St. Leonard's	50 0 0	6 0 0	60 0 0
		Haverfordwest			
		Haverhill			
		Haworth, Yorks.			
		Helstone			
		Hemel Hempstead			
300	10	Henley-on-Thams.	10 0 0		
		Hereford £5300		4 0 0	
		Herne Bay			
270	10	Hexham	10 0 0	7 0 0	12 0 0
		Heywood £10,000		7 10 0	
230	10	Hinckley	10 0 0	5 0 0	7 0 0
		Hindley, Lancash.			
		Hitchen			
		Hythe			
		Holbeach			
		Holmfirth £8335		6 0 0	
		Holyhead			
		Holywell (see British Provincial)			
		Honiton			
	10	Horncastle			
		Houghton-le-Sprg.	10 0 0	8 0 0	
		Horsham			
		Howden			
		Hull, Sculcoats (see British Provin.)			
		Hull, Broadley-st. £11,712. 10s.		8 0 0	
		Hungerford			
		Huddersfield			
520	5	High Wycombe	5 0 0		5 0 0
		Hyde, Cheshire			
		Ilminster			
		Ilford			
		Ilfracombe			
		Ironbridge			
1400	10	*Ipswich*	10 0 0	8 0 0	15 0 0
1100	10	,, new shares	5 0 0	8 0 0	
800	25	*Isle of Thanet* (Ramsgate & Mar.)	20 0 0	5 0 0	17½ to 18
		Kendal £7600		7 10 0	
		Kenilworth			
		Keswick			
100	25	Kettering	25 0 0	5 0 0	25 0 0
		Kiddermins. £8000		5 0 0	
		King's Langley			
		Kington, Hereford			
		Knutsford			
		Llanelly			
		Llandovery			
		Launceston			
		Leamington Priors £20,000		6 0 0	
		Ledbury			
		Leeds Old Comp. old stk., £60,300		10 0 0	
		new ,, £11,527		6 0 0	
		Leeds New Comp.			
		Leek			
		Leicester		7 0 0	
		Leigh			
125	20	Leighton Buzzard	20 0 0	5 0 0	
		Leominster			
		Leyburn, Yorksh.			
		Liskeard			
330	25	Lewes	25 0 0	5 0 0	23 0 0
		Lincoln £8000		10 0 0	
		Leyland, Lancash.			
		Lichfield			
		Liverpool United	100 0 0	10 0 0	{146 to 148
		,, ½ sh.	25 0 0	10 0 0	32 to 34
		Langport			
		London Comps.—			
5000	40	*British*	18 0 0	5 11 1	13 to 15
		,, debentures		4 0 0	
5000	20	,, Prov.—(Ayr, Clonmel, Gloucester, Holywell, Hull, Norwich, Stoke, Trowbridg)	20 0 0	7 0 0	19 to 21
	20	,, Prov., new	3 0 0	7 0 0	3 to 3½
	25	*Commercial*	25 0 0	5 10 0	25 to 26
	25	,, new shres	10 0 0	5 10 0	pr. to ½pm.
	25	,, ,,	2 10 0	5 10 0	pr. to ½pm.
12,000	50	*Chartered*	50 0 0	6 0 0	45 to 47
6000	50	,, new shares	10 0 0	6 0 0	9 to 9½
1000	100	*City of London*	100 0 0	10 0 0	240 0 0
10	100	,, new shares	75 0 0	10 0 0	210 0 0
4000	50	*Equitable*	50 0 0	4 10 0	32 0 0
10,000	20	European— (Amiens, Boulogne, Caen, Havre, Nantes, and Rouen)	20 0 0		9 to 10
8000	50	*Impl. Continental*—(Amsterdam, Aix-la-Chapelle Antwerp, Berlin, Bordeaux, Brussels, Cologne, Frankft., Ghent, Haarlem Hanover, Lille, Marseilles, Rotterdam, Toulouse, Vienna)	42 0 0		35 to 37
7000	50	,, new shares	38 0 0		38 to 40
	50	,, third issue	42 10 0		52 to 55

Number of Shares issued.	Amount per Share	Name of Company.	Amount paid up per Share	Dividend per Cent. per Ann.	Price.
	£		£ s. d	£ s. d	£ s. d
10,000	50	*Imperial*	50 0 0	6 0 0	64 to 66
		„ debentures			
4000	40	*Independent*	40 0 0	6 0 0	60 to 62
3000	50	*London*	50 0 0		10 to 20
3000	50	„ preference	50 0 0		20 to 30
9000	50	*Phœnix*	47 0 0	5 0 0	28 to 30
320	50	*Poplar*	50 0 0	4 0 0	28 to 30
1000	100	*Ratcliff*	90 0 0	5 0 0	73 to 75
4000	25	*South Metrop.*	25 0 0	6 0 0	21 to 23
9000	50	United General—(Cork, Dublin, Limerick)	50 0 0	2 10	13 to 15
12,500	20	Western	10 0 0		
		Lostwithiel			
		Loughborough			
240	25	*Louth*	25 0 0	6 0 0	26 10 0
		Lowestoft (see Beccles)			
611	5	Ludlow Union	5 0 0	6 0 0	5 0 0
		Luton			
		Lyme Regis			
		Lymington			
		Malmesbury			
		Macclesfield £20,000		4 13 5	
		Maidenhead			
250	50	Maidstone	50 0 0	10 0 0	100 0 0
		Maldon			
		Marlborough			
		Malton (New)			
		Manningtree			
		Mansfield £5000		10 0 0	
		March			
		Margate (see Isle of Thanet)			
		Market Bosworth			
		Market Deeping			
132	25	Market Harboro'	25 0 0	6 0 0	30 0 0
		Market Raisin			
		Market Weighton			
		Marlow			
370	10	Maryport	10 0 0	6 0 0	12 0 0
		Melksham			
		Melton Mowbray			
		Merthyr Tydvil			
		Mere			
		Middleton £5000			
		Midsummer Norton			
		Middlesboro'			
		Mildenhall			
		Milford Haven			
		Mold			
700	10	Monmouth Gas and Water	10 0 0	4 0 0	
		Monk Wearmouth			
		Moreton in the Marsh			
		Nantwich			
		Neath			
		Needham Market			
		Newark £5000		10 0 0	
250	10	Newbury	20 0 0	5 0 0	20 0 0
13,000	5	Newcastle & Gateshead Union	5 0 0	10 0 0	6 12 6
		Newcastle-under-Lyne £5000		5 0 0	
600	5	Newmarket	5 0 0	6 0 0	5 0 0
		Newnham, Gloster			
		New Mills & Hayfield £2115			
		Newport, Monmouthshire			
320	50	*Newport, Isle of Wight*	38 0 0	4 0 0	21 to 23
		Newport Pagnell			
		Newport, Salop			
		Newton Abbot			
		Newton, Lancash.			
		Northallerton			
		North Walsham			
		Northampton			
		Northwich			
		Norwich (see British Provincial)			
		Nottingham £42,500		10 0 0	
		Nuneaton			
		Oakham			
		Oakhampton			
200	10	Odiham, Hants	10 0 0		10 0 0
		Oldham			
		Ongar			
		Ormskirk			
		Otley, Yorkshire			
		Oundle			
		Oxford £18,000		9 10 0	
		Over Darwen £8000		5 0 0	
		Pately Bridge, Yorkshire			
		Pembroke			
250	20	Penrith	15 0 0	6 10 0	21 0 0
		Penryn			
		Penzance			
200	10	Petworth	10 0 0	9 10 0	14 10 0
		Pickering			
3000	10	*Plymouth & Stonehouse*	10 0 0	6 0 0	11 0 0
		Pocklington			
		Pontefract			
480	10	Poole	10 0 0	5 0 0	10 0 0
		Port Madoc			
600	50	*Portsea Island*	53 0 0	5 0 0	47 to 49
400	10	Prescott	9 0 0	4 13 4	7 0 0
		Preston £52,500		10 0 0	
		Pwllheli			
		Pontypool			
		Pudsey			
		Radcliff and Pilkington £9000		4 12 10	
		Ramsay, I. of Man			
		Ramsgate (see Isle of Thanet)		3 0 0	
		Reading £10,190			
		Reading Union			
		Redditch			
		Redruth			
		Reigate			
		Retford (East)			
		Richmond, Surrey			
		Ripon			
		Rochester and Chatham £14,000		6 0 0	
		Rochford			
		Rockingham			
		Ross			
		Rotherham £4000		10 0 0	
		Royston			
		Rugby			
		Rugeley			
		Ruthin			
		Runcorn			
500	10	Ryde	10 0 0	6 0 0	12 0 0
		Rye			
		Romsey			
		Saddleworth			
225	20	Saffron Walden	20 0 0	3 15 0	19 0 0
		St. Austel			
		St. Colomb			
		St. Helen's £7200		5 0 0	
		St. Ives, Huntingd.			
		St. Ives, Cornwall			
		St. Neot's			
		Salisbury			
		Sandbach			
		Saxmundham			
		Scarborough			
		Selby			
		Settle			
290	10	Sevenoaks	10 0 0	5 0 0	10 0 0
		Shaftesbury			
5400	25	*Sheffield United*	24 0 0	8 6 4	32 0 0
		Shelton, Potteries (see Brit Prov.)			
		Shepton Mallet			
		Sherborne			
2914	5	Shields, North (Tynemouth)	5 0 0	3 0 0	5 0 0
		Shields (South)			
		Shiffnal, Salop			
		Shipley			
		Shipston-on-Stour			
		Shrewsbury £10,000		7 0 0	
400	10	Skipton	10 0 0	4 0 0	11 0 0
		Sleaford			
		Somerton			
		Southam			
		Southwold			
		South Molton			
1000	50	*Southampton*			
		Sowerby, Yorksh.			
		Stokesly			
		Stafford £10,000			
		Staines and Egham			
		Staley Bridge £15,000		10 0 0	
		Stamford £11,250			
		Stockport £34,200		7 11 0	
		Stockton-on-Tees £3600		8 0 0	
840	9½	Stockton, New	9 10 0		8 0 0
950	10	Stoke-upon-Trent	10 0 0	6 10 0	12 0 0
500	10	„ new shares	3 0 0	6 10 0	5 0 0
		Stone, Stafford			
		Stoney Stratford			
		Stourbridge			
		Stowmarket			
		Stratford-on-Avon			
		Stroud			
169	10	Swaffham	10 0 0	5 0 0	5 10 0
		Swansea £9000			
		Sudbury			
		Sunderland, old			
6400	5	Sunderland, new	5 0 0		
		Swindon			
2800	5	*Taunton*	5 0 0		2 10 0
		Tadcaster			
		Tamworth			
		Tavistock			
		Teignmouth			
		Tenbury			
		Tenby			
		Tenterden £3000		2 10 0	
		Tetbury, Gloster			
		Tewkesbury			
		Thetford			
		Thirsk			
		Thornbury			
		Thorne			
		Tiverton			
670	5	Todmorden	3 0 6		
		Torquay			
		Torrington, Devon			
		Totness			
		Tottenham		6 0 0	
		Towcester			
		Tring			
		Trowbridge (see British Provinl.)			
75	50	Truro	50 0 0	2 0 0	
		Tunbridge			
		Tunbridge Wells			
		Ulverston			
		Uppingham			
		Usk, Monmouth			
		Uttoxeter			
		Uxbridge			
1000	25	*Wakefield*, old capl	25 0 0	6 0 0	24 0 0
1600	5	„ new „	5 0 0	6 0 0	4 16 0
300	10	Wallingford	10 0 0	5 0 0	8 0 0
		Wandsworth			
		Wantage			
		Warrington £18000		10 0 0	
100	10	Wareham	10 0 0	3 10 0	8 0 0
120	25	Warminster	25 0 0	5 0 0	27 0 0
		Warth			
		Warwick £15,000		6 0 0	
		Watford			
		Weichpool, Mntgy.			
		Wellingborough			
		Wellington, Salop			
		Wellington, Smrst.			
		Wells, Smrst. £4000		6 0 0	
		Wenlock			
		Westbury			
		Weston-sup.-Mare			
2000	5	West Ham	5 0 0	4 0 0	5 0 0
		Whitby			
		Whitehaven			
		Whittlesea			
		Wigan £10,160		5 0 0	
		Willenhall			
		Winchelsea			
		Winslow			
240	10	Wimborne Minster	10 0 0		
		Wincanton			
		Winchester			
900	12½	Windsor	12 10 0	10 0 0	23 0 0
		Witham			
		Witney			
4448	10	*Wolverhampton*	10 0 0	7 10 0	11 10 0
		Woburn			
210	10	Wokingham	10 0 0		10 0 0
		Woodbridge			
		Wotton-un.-Edge			
		Worcester			
		Workington			
		Worksop			
		Wirksworth			
		Worthing			
		Wrexham			
		Woolwich			
		Woolwich Consms.			
		Wymondham			
		Yarm			
795	20	Yarmouth	20 0 0		15 to 16
		Yeovil			
		York Untd. £35,000			
		SCOTLAND.			
		Aberdeen			
		Airdrie			
		Alloa			
		Anstruther			
		Ardrossan, nr. Saltcoats			
550	20	Arbroath	20 0 0	7 10 0	27 10 0
		Auchterarder			
		Auchtermuchty			
		Ayr, old (see Brit. Provincial)			
		Ditto, new			
		Banff			
		Bathgate			
		Beith			
		Boggar			
250	6	Borrowstowness	6 0 0	5 0 0	8 0 0
		Brechin			
		Broughty Ferry, near Dundee			
		Burntisland			
		Campbelton			
		Clackmannan, near Alloa			
		Coatbridge			
		Coldstream			
		Collinsburgh			
		Crieff			
		Crail, Fife			
		Cumbernauld, near Glasgow			
600	5	Cupar Angus	5 0 0	6 0 0	5 10 0
250	10	Cupar Fife	10 0 0	7 10 0	14 0 0
		Dalkeith			
		Dingwall			
		Dumbarton			
400	20	Dumfries	14 0 0	5 0 0	20 0 0
		Dunbar			
		Dunblane			
		Dundee, old			
		„ new			
860	10	Dunfermline	10 0 0	6 0 0	12 12 0
		Dunkeld			
		Dunse			
		Dysart			
6000	25	*Edinburgh Gas Co.*	25 0 0	10 0 0	45 0 0
		„ *and Leith Co.* £150,000		6 10 0	
		Elie			
		Elgin			
		Falkirk, old			
		new			
		Falkland			
		Ferry Port on Craig, Fife			
		Forfar			
		Fort William			
		Fraserburgh			
		Galashiels			
		Girvan			
		Glasgow £122,500		5 0 0	
15000	10	*Glasgow City and Suburban*	9 0 0	7 10 0	9 0 0
		Grangemouth			
		Haddington			
		Hamilton			
		Hawick			
		Helensburgh			
		Inverary			
400	1	Inverkeithing	1 0 0	5 0 0	1 0 0
1200	10	*Inverness Gas and Water*	10 0 0	8 0 0	15 0 0
2400	5	„ new shares	1 5 0	8 0 0	2 5 0
		Irvine			

Number of Shares issued.	Amount per Share £	Name of Company.	Amount paid up per Share £ s. d	Dividend per Cent. per Ann. £ s. d	Price. £ s. d
		Jedburgh			
		Keith			
		Kelso			
		Kilmarnock			
		Kinghorn			
		Kingskittlo, Fife			
		Kinross			
		Kirkaldy			
320	5	Kirkcudbright	5 0 0	5 0 0	5 0 0
1000	3	Kirkintilloch, near Glasgow	3 0 0	5 0 0	3 0 0
227	5	Kirkwall	5 0 0	5 0 0	4 10 0
518	5	Kirriemuir	5 0 0	6 0 0	
		Lanark			
		Largo, near Leven			
		Largs			
		Lasswade, n. Edinburgh			
		Lauder			
		Leith			
		Leslie, Fife			
		Lesmahago			
		Leven			
		Linlithgow			
		Linton, n. Nobleh.			
		Lochee, n. Dundee			
		Lochgilphead			
		Lochwinnoch, near Paisley			
		Mauchline			
		Maxwell-town, n. Dumfries			
		Melrose			
718	2	Mid & East Calder	2 0 0		2 0 0
192	5	Moffat	5 0 0		
		Montrose			
		Musselburgh			
		Nairn			
		Neilston, n. Glasg.			
		Newburgh, Fife			
		Newton Stewart			
		North Berwick, n. Haddington			
		North Queensferry			
		Oban			
		Peebles			
800	25	Perth	25 0 0	1 4 0	22 10 0
		Peterhead			
		Pittenweem			
		Pollokshaws, near Glasgow			
		Port Glasgow			
		Portobello, near Edinburgh			
		Prestonpans			
		Renfrew, n. Paisley			
		Saltcoats			
		Selkirk			
		South Queensferry			
		St. Andrew's			
		Stewarton			
		Stirling			
		Stonehaven			
		Stranraer			
		Strathaven, near Hamilton			
		Thurso			
		Tillicoultry, near Alloa			
800	1	Tranent	1 0 0		1 0 0
		Troon			
		Wick			
		Wigton			
		Wemyss		4 10 0	

Number of Shares issued.	Amount per Share £	Name of Company.	Amount paid up per Share £ s. d	Dividend per Cent. per Ann. £ s. d	Price. £ s. d
		IRELAND.			
300	10	Armagh	10 0 0	8 0 0	14 10 0
700	50	*Belfast*	50 0 0		
		Ballymena			
		Cashel			
		Carlow, new			
		Cork (see United General)			
		Coleraine			
		Clonmel (see British Provincial)			
		Drogheda			
19,000	5	*Dublin Consumers* £190,000	5 0 0	6 0 0	5 0 0
		Dublin Hibernian (see United Gen.)			
160	25	Dundalk	35 0 0		22 0 0
		Dungannon			
		Downpatrick			
		Galway			
400	10	Kilkenny	10 0 0	8 0 0	11 5 0
		Limerick (see United General)			
1735	5	Limerick Consumers	5 0 0	5 0 0	5 0 0
600	15	Londonderry	15 0 0	6 13 4	21 10 0
500	6½	Lisburn	6 5 0	0 5 0	6 5 0
520	10	Lurgan	6 0 0	6 0 0	6 0 0
		Nenagh			
448	5	Newtownards	5 0 0	4 0 0	5 0 0
		Newry			
125	20	Portadown	13 0 0		
		Sligo			
		Waterford			
		Wexford			

The Gas Works in the undermentioned towns belong to private individuals:—

Carlow, old. Deal. Ely. Farsley. Gainsborough. Goole. Hertford. Holt. Huntingdon. Kingston-on-Thames. Lancaster. Lynn. Morpeth. Oswestry. Peterborough St. Alban's. Sandwich. St. Helier's, Jersey. Sheerness. Sidmouth. Sittingbourne. St. Peter's Port, Guernsey. Spalding. Romford. Thame. Waltham Abbey. Ware. Wem. Weymouth. Whitchurch (Salop). Wisbeach.

The Gas Works belong to the Corporations, or to Commissioners acting under special acts of Parliament, in the following towns:—

Greenock. Keighly. Knaresborough. Manchester. Milton (Kent). Paisley. Rochdale. Rothesay. Richmond (Yorkshire). Salford. Strabane. Walsall. Wells (Norfolk).

*** We should feel greatly obliged by agents, or others interested, furnishing us with such corrections for our Share List as we may not have received through our usual channels of communication; our object being to present as accurate a list of prices as can be obtained; to procure which, we solicit the aid of correspondents in general.

Price Current.

The following List of Prices is corrected by an eminent wholesale house in each trade up to the latest period:—

CASTINGS, per Ton.

Average Weight of Cast Iron Pipes, per Yard.

1½ in.	2 in.	2½ in.	3 in.	4 in.	5 in.	6 in.	7 in.	8 in.	9 in.	10 in.	12 in.
16	21	28	33	51	70	89	107	126	149	177	208 lbs.

Retail Prices are 5 to 10 per cent. higher.	London. £ s. d.	Glasgow £ s. d.	Newcastle. £ s. d.	Wales. £ s. d.	Yorkshire, Derbyshire, and Staffordshire. £ s. d.
Pig Iron, No. 1	3 7 6	2 10 0	3 0 0	3 15 0	3 10 0
1½ and 2 inches Socket Pipes	6 0 0	5 0 0	5 10 0	5 15 0	5 15 0
2½ and 3 do. do.	5 17 6	4 17 6	5 7 6	5 12 6	5 12 6
4 and 5 do. do.	5 15 0	4 15 0	5 5 0	5 10 0	5 10 0
5 inches and upwards do.	5 12 6	4 15 0	5 2 6	5 7 6	5 7 6
Extra for bends, branches, and connection	2 0 0	2 0 0	2 0 0	2 0 0	2 0 0
Retorts, 1st fusion	5 2 6	..	..	4 17 6	5 0 0
Do. 2nd fusion	5 10 0	4 10 0	4 17 6	5 5 0	5 5 0
Tank Plates, ¼ thick and above	5 10 0	4 17 6	5 0 0	5 7 6	5 7 6
Do. less than ¼	5 15 0	5 0 0	5 5 0	..	5 10 0
Plain Castings ex. models	5 15 0	5 0 0	5 5 0	5 10 0	5 10 0

COALS.

NEWCASTLE. Unscreened.	s. d.	
Tyne Main	5 6	per ton.
Ravensworth Pelaw, Dean's Primrose, Pelton	5 9	,,
Medomsley*, New Tanfield	6 0	,,
Pelaw	6 3	,,
Eighton Moor, Felling Main, Hutt's Tanfield, New Pelton, Peareth, South Pelaw, Waldridge, South Peareth, South Pontop	6 6	,,
Ramsay's Cannel	15 0	,,

DERBYSHIRE. Unscreened.	s. d.	
Clay Cross, Deep Main, Jerries, New Birchwood, New Shipley, Sleight's, Soft Main	6 6	per ton.

SCOTCH CANNEL.		
Kirkness best	23 0	,,
Ditto seconds	14 0	,,
Lothian	18 0	,,
Lesmahago	16 0	,,
Wemyss	15 0	,,
Dombristle, Luthans	12 0	,,
Bridgeness, Kinneil	11 0	,,
Lochgelly, Lumphumans	10 0	,,

FIRE GOODS.

Best Fire Bricks, 60s. per thousand, at Newcastle.
Do. Clay, 12s. per ton do.

WROUGHT IRON TUBING, subject to 25 per cent. Discount.

	2 inches. s. d.	1½ inch. s. d.	1¼ inch. s. d.	1 inch. s. d.	¾ inch. s. d.	½ inch. s. d.
Patent welded tubes, from 4 to 12 feet, per foot	1 8	1 0	0 10	0 7	0 5	0 4½
Ditto ,, 2 to 4 feet	One penny per foot extra.					
Ditto ,, 6 in. to 18 in., each	3 0	2 0	1 9	1 3	1 0	0 9
Connecting pieces, or long screws	3 6	2 3	2 0	1 6	1 2	0 11
Bends, wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Springs, wrought iron	3 9	2 3	1 9	1 0	0 10	0 8
Elbows, wrought or cast	3 9	2 3	1 9	1 0	0 10	0 8
Tees, wrought or cast	4 0	2 6	2 0	1 6	1 1	0 10
Crosses, wrought or cast	4 6	3 0	2 6	2 0	1 6	1 2
Iron cocks	17 6	9 6	7 6	4 6	3 3	2 6
Ditto, with brass plug	28 0	16 0	13 0	7 0	5 6	4 6
Diminishing sockets	1 3	0 9	0 8	0 6	0 5	0 4
Plain sockets	1 0	0 8	0 7	0 5	0 4	0 3
Caps, plugs, nipples, backnuts	1 3	0 9	0 8	0 6	0 5	0 4
Flanches	1 9	1 6	1 3	1 0	0 9	
Syphons, 2 quart	15 0	14 0	13 6	13 0	12 0	
Ditto 1 quart	11 0	10 0	9 6	9 0	8 6	
Tongs or nippers each pair	9 0	7 0	6 6	5 6	4 9	4 6
Elbow burners per dozen	7 6	jet or batwing.				
Straight burners ,,	6 0	ditto.				

Stocks, dies, and taps, for 2 inch, 1½ inch, and 1¼ inch tubing ..... £8 10s. 0d. per set.
Ditto, do. and do. ,, 1 ,, ¾ ,, and ½ ,, ,, ... 5 5 0 ,,
Ditto, do. and do. ,, ¾ ,, 2-8 ,, and ½ ,, ,, ... 3 0 0 ,,

FREIGHTS, per Ton.

Coastwise—Newcastle.	s. d.
Chatham & Roches.	6 6
Colchest. & Maldon	6 0
Cork	9 0
Dartmouth	9 0
Devonport	9 0
Dover	6 6
Dublin	9 0
Exeter Quay	9 6
Faversham	7 0
Folkestone	7 0
Hastings	8 0
Ipswich	6 0
Jersey	9 0
London	5 6
Lowestoft	5 0
Lynn	5 0
Limerick	11 0
Margate	6 0
Newhaven	7 0
Portsmouth	8 0
Plymouth	9 0
Rye	8 0
Southampton	7 9
Totnes	8 0
Teignmouth	8 6
Weymouth	8 6
Yarmouth	5 3
Foreign.	
Algiers	20 0
Amsterdam	8 6
Antwerp	8 4
Boulogne	7 0
Barcelona	21 0
Bordeaux	10 6
Calais	7 0
Caen	9 0
Cadiz	12 6
Cette	17 0
Dieppe	8 0
Genoa	21 0
Hamburg	
Havre	8 0
Honfleur	8 3
Leghorn	19 0
Lisbon	11 0
Marseilles	16 0
Nantes	12 0
Naples	21 0
Rotterdam	7 0
Rouen	11 0
Toulon	17 0
Trieste	22 0
Venice	22 0